

**JPRS-UEN-86-002**

**24 January 1986**

# **USSR Report**

**ENERGY**

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24 January 1986

**USSR REPORT  
ENERGY**

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OIL AND GAS

MODERNIZING MANAGEMENT IN THE GAS INDUSTRY DISCUSSED

Moscow GAZOVAYA PROMYSHLENNOST in Russian No 2 Feb 85 pp 1-2

[Article by I. Ya. Fomichev, a Department Chief of Glavstroygazoprovoda (the Main Directorate for Gas Pipeline Construction): "To Modernize the Management Mechanism" under the rubric "Decisions of the 26th CPSU Party Congress Brought to Life"]

[Excerpts] The course which the party adopted concerning accelerating the intensification of public production and increasing its effectiveness is the chief direction of economic development of the nation at this stage. From this, economic work in the branch in recent years has been reoriented toward intensive management of the economy, maximum full use of productive potential, and savings of all types of resources. The success of this work by and large depends on increasing the level of planning leadership, modernizing planning and economic stimulation.

There has been set up in the branch a system of developing basic directions, systems of development of the gas industry in the long view, and five-year and annual plans. This allows us to provide continuity to planning. Enlisting in this work practically all project planning and scientific research institutes, associations, and enterprises, broad evaluation of the basic problems of projected development of the branch with the participation of highly qualified specialists has allowed us to increase the validity and stability of plans.

In this Five-Year Plan the role of five-year planning has been significantly increased for the organization of domestic services at associations and enterprises. The task established by the ministry for the state plan of economic and social development of the gas industry during the 11th Five Year Plan in extracting gas, in volumes of production and in basic economic indicators is being fulfilled. For four years the task for gas extraction for the nation as a whole has been exceeded by more than 35 billion cubic meters. The tempo of growth in industrial production in the ministry reached 28.5 percent against a growth rate tasked in the plan of 27.9 percent.

The majority of industrial associations are fulfilling and exceeding the tasks of the Five Year Plan in labor productivity, expenditures per ruble of goods production, and other economic indicators.

The plan for 1985 has been confirmed and delivered to the associations and enterprises. In this final year of the Five Year Plan the volume of industrial production will grow by 9.8 percent. There are plans to provide for a great deal of growth in extraction of natural gas, petroleum, condensate, and other products with a significant improvement in the quality indicators of the branch's work. Labor productivity must grow by 6.6 percent, and compared to the 1980 level, by 28.4 percent against a Five-Year Plan goal of 26 percent. Expenditures per ruble of goods production are to be decreased by 5.5 percent of the established Five-Year Plan task, including material expenditures by 3 percent.

Bringing all that was mentioned to life is the primary task for the collectives of the enterprises and organizations of the branch. For its successful resolution it is necessary to work with greater results, and to effectively use resources and the progressive forms of labor organization. In other words, we must conduct business rationally. There is great value attached to development of intraproduction management accounting which improves the organization of labor and makes possible the appearance of reserves, and improves the work indicators for services, work crews, and shops.

In this issue there are published selected materials which address the basic question of modernizing economic work in the branch and of implementing intraproduction accounting procedures at associations and enterprises.

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OIL AND GAS

EXPLORATORY DRILLING TO INCREASE IN KAZAKHSTAN GURYEV OBLAST

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 8, Aug 85 pp 3-4

[Article by U. Kushekow, First Secretary of the Guryev Obkom of the Kazakhstan Communist Party: "Toward the 27th CPSU Congress: With Initiative and a Businesslike Manner"]

[Excerpt] In resolving issues of intensifying production, the oblast party committee attaches great significance to the development of enterprises in the leading industries of the economy: petroleum production and refining, chemicals and fishing. Since the beginning of the five-year plan, the amount of deep drilling into the subsalt structures has been increased in the most promising areas of the Yuzhno-Emba Uplift, in the area between the Ural and Volga rivers and in the Caspian zone, operations have been continued to evaluate already-discovered deposits and regional geological and geophysical prospecting has been strengthened.

Oblast petroleum workers have achieved an increase in the output of active deposits. This became possible thanks to their overall reorganization, the automation of production technology and the application of progressive methods of attacking formations. This work allowed the production of more than 140,000 tons of petroleum in excess of the plan in four years.

We are not only solving the complex problems of today, but we are planning new tasks for the near future as well.

A further increase in the volume of exploratory drilling by a factor of 1.7 is envisaged in the next five-year plan, along with the introduction of petroleum production capacity and a complex for refining hydrogen sulfide gas and the wide fraction of hydrocarbons at the Tengiz deposit. More than one billion rubles of capital investment must be acquired to implement this program, which testifies to its size and complexity.

Creating a major oil- and gas-producing region in the country's Caspian Basin will have a great effect on the further growth of the oblast's productive forces. That is why the further development of oblast industries should be viewed as a unified system based on territorial unity.

On this basis, the reconstruction and technical retooling of the Guryev

Machine-Building Plant imeni Petrovskiy is being implemented at an accelerated rate. This enterprise is a supplier of drilling tools and equipment. In the near future, the collective of the plant will have to retool production with modern machining equipment, master the output of products with anti-corrosive coatings and thus satisfy the ever-growing requirements of the petroleum workers and geological prospectors of West Kazakhstan.

The petroleum industry is one of the leading industries of the oblast. Its development is at the center of the oblast party committee's attention. In the 11th Five-Year Plan, a delayed-action coking installation was brought to planned capacity ahead of schedule at the Guryev Petroleum Refinery imeni V. I. Lenin. Owing to reconstruction, secondary processes were expanded and the output of four new types of product were mastered.

The need for a further increase in capacity has currently become imminent, which will allow an extension of petroleum refining, an increase in the selection of white petroleum products, and the production of supplementary raw materials for the petrochemical and microbiological industries.

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OIL AND GAS

UDC 622.276.1/.4.04.658.5

TRANSPORT, SETTLEMENT STRATEGIES SERVING OFF-SHORE DRILLING AREAS

Moscow GAZOVAYA PROMYSHLENNOST in Russian No 2, Feb 85 pp 33-34

[Article by V. V. Yemel'yanovich of the Moscow Construction Engineering Institute (MISI) imeni V. V. Kuybyshev: "Resettlement and Transportation Services in Regions of Off-Shore Extraction of Petroleum and Gas"]

[Text] In connection with further development of the nation's fuel and energy base there is a large program underway to develop petroleum and gas deposits on the continental shelf. In this context a great deal of attention is being paid to problems of developing the shelves of the Arctic and Eastern Seas, since these zones are characterized by extreme climactic conditions, and are ill-suited for economic development and settlement.

In the regions connected with petroleum and gas which have been settled, the first priority is the development of the natural resources. Settlement and resettlement on the territory and the development of social and engineering infrastructures are to be accomplished along with the attainment of these main purposes.

In areas with extreme conditions, settlement and its forms to a large degree depend on the seat of economic development, complex transportation and severe natural conditions, features of the demographic makeup of the populace, and so on. Since the beginning of the 1970's in such regions there has been in progress a process of reformation of autonomous populated places in groups of independent urban settlements which appear as groups of small cities and villages, the center of which is a base city. The basic criterion for this system is the amount of time spent in traveling to the work site from the domicile. These expenditures are optimumized by determining the settlement areas for the workers relative to the designated workplace and should not exceed two hours [1]. Although formation of the group system is a progressive tendency, it is impossible to use a conventional approach to its organization in remote, poorly organized areas. Experience in exploiting petroleum and gas

resources in the West Siberian North has shown that to successfully exploit these resources and organize settlement, together with the traditional there must be use of the watch and expedition methods.

The watch method is characterized by the settlement of continuously occupied living sites and remote work sites, to which regular delivery of work crews must not exceed two hours and the duration of the crews' stay at the watch site is two weeks.

The expedition method provides for inter-regional use of labor resources, when the workers are delivered from their regular living quarters to a work site where they stay from two weeks to several months.

The problem of exploiting the Arctic shelf is connected with the creation of comfortable conditions for work, living, and rest for personnel. In this zone it is essential to provide more rational formation of settlement systems which will satisfy social, economic, and city-building criteria.

At the city-building faculty of the MISI imeni V. V. Kujbyshev there are being developed city-building principles for the formation of settlement systems in extreme natural and climactic conditions like those of the Sea of Okhotsk, which would coincide to the maximum extent to the character of the exploitation of the off-shore deposits of petroleum and gas, and also look at engineering and technical questions which are connected with the organization of transportation services for the populated points based on the example of the Okhinsko-Noglinskiy industrial region of Sakhalin Island.

The features of off-shore petroleum and gas extraction include:

work is conducted with ice-resistant stationary platforms (LSP), which are erected at a significant distance from shore (20-50 kilometers);

personnel are delivered to the platform primarily by helicopter;

the reliability of transportation communications with the LPS is very dependent on weather conditions.

The short term of exploitation of off-shore deposits also determines the forms of settlement. One could conclude that the conditions of industrial use of the region lead to the formation of systems of settlement with a high level of mobility. On the basis of such systems there is placed a contingent of permanent base cities, which are system-forming centers, and also temporary work sites. At the base city the workers are provided with living quarters and all forms of services. The mobile elements in a system of "watch - base city" format are the petroleum and gas platforms themselves, where there are industrial and living facilities for 150-200 persons with temporary quarters for the watch personnel for two weeks, and a mobile village on the shore with family quarters for the term of service of the deposit. The "watch - base city" system is looked upon as the single city-building form which has the usual social infrastructure, transportation connections, and production base. A special place in this system is occupied by transportation services.

The time it takes to deliver workers to the watch site can be varied within very broad limits. The lower limit for the time factor is determined to be one and one-half to two hours considering the maximum attainable expenditure of time for everyday work communications [2]. The upper limit is connected with the duration of the watch -- the longer it is, the more time can be spent. It is essential to consider that the total time for delivering the workers from their living quarters to their work sites must not exceed the budget for personal time of the workers who work in cities in the usual way. In accordance with this, in the opinion of A. D. Khaytun [3], for a week long watch the maximum total one-way travel distance can be four to five hours, and for the round trip -- seven to eight hours.

With the intent of developing recommendations for selecting a rational system for transportation service there were conducted transportation and socio-logical studies of the workers of Sakhalinneftegazprom [the Sakhalin Petroleum and Gas Production Association] who worked at on-shore exploratory and drilling sites. As a result of the studies data were compiled for time spent for the trip to work and the type of transport used. Usually the workers of the association work in two systems -- one watch in one to two weeks.

The studies showed that the trips in the so-called traditional method (daily) were done on special busses and all-terrain vehicles. The average time for the daily trip was 80 minutes, which corresponds to the norm for time spent on traveling to work in group systems of settlement. When the association's workers were transported to the work site for a week-long shift by bus, the maximum time for the trip was established at more than four hours, which is the upper limit under these conditions.

Experience with perfecting the deposits shows that where there are automobile roads between the deposits and the settlements, the distance traveled on them did not exceed 200 kilometers. For a longer distance air transportation -- the helicopter -- is used.

Watch trips to deposits on-shore were accomplished basically by a single type of transportation -- the bus or helicopter. Such trips to off-shore deposits will be organized most often using two forms of transportation -- surface and air. This is connected with the fact that when settling the workers in the system there appear other mobile elements -- villages on the shore and the platform itself.

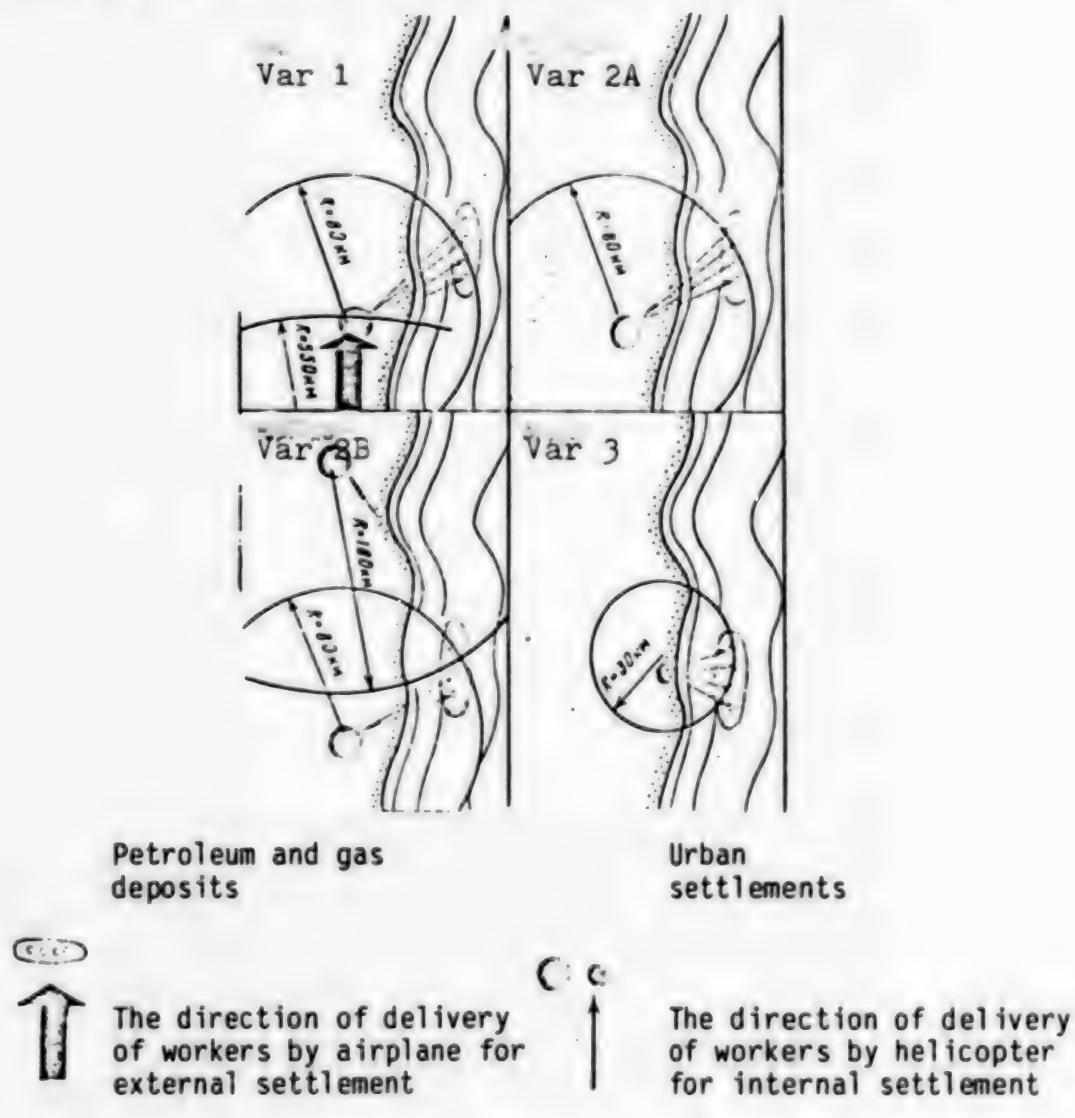
Preliminary studies show that the basic variants in the systems of settlement and transportation services in off-shore areas for petroleum and gas extraction will be as follows (see the illustration):

Variant 1 -- external settlement in the expedition method of adoption. Delivery of shift personnel is done in two stages: first the personnel are flown by plane to a base city from a reference point where they leave, and then they are flown by helicopter along the "base city - watch" connection to the deposits.

Variant 2 -- internal centralized settlement under the watch system, which includes:

- subvariant A with one base city;
- subvariant B with two base cities;

Variant 3 -- internal concentrated settlement, which provides for relocating villages on the shoreline at the shortest distance from the off-shore deposit. Each group of deposits will have its own corresponding settlement, which will be a mobile village with family quarters, calculated for the term of exploitation of the deposit. Transportation of the workers to the platforms is done basically by helicopter (during summers a cutter might be used, and in winter, air cushion vehicles.



Diagrams of variants for the shelf zone

Technical and economic indicators of the variants

Objects of expenditures	Settlement variant			
	1	2A	2B	3
<b>Capital expenses, millions of rubles</b>				
Cities	0.186	5.768	5.768	--
City type villages	1.903	1.922	1.922	8.690
Transportation	1.400	0.560	1.207	0.280
Totals	3.498	8.250	8.897	8.970
<b>Exploitational expenses in millions of rubles</b>				
Cities	0.223	7.209	7.209	--
City type villages	2.379	2.403	2.403	10.612
Transportation	0.659	0.752	1.279	0.301
Totals	3.261	10.364	10.891	10.913
<b>Incurred expenses in millions of rubles</b>				
	6.750	18.614	19.788	19.883

Note: Delivery of personnel is accomplished only by air transportation. For variant 1 -- airplane and helicopter; for variants 2 and 3 -- helicopter

Under examination, each variant has its plusses and minuses. Variant one provides for a high level of the comforts of life, a sharp decrease in expenses for the construction of living quarters and cultural amenities, and no expenses for transporting the shifts. Shortcomings include the long family separations of the shift workers, the difficulties of their partial acclimatization and reacclimatization, and also insufficient reliability of regular air communications under the conditions of Northern Sakhalin. Variants 2A and 2B are characterized by a very high level of cultural and domestic services (the shortcomings shown above for variant one are absent), but the population will have to live in severe weather conditions with high construction costs. Variant three has more shortcomings brought about by the small autonomous settlement. The technical and economic indicators of the variants which were studied are presented in the table.

From the table it is seen that according to the construction and exploitation expense alternatives presented, the best variant is variant one; and the least effective is the decentralized method of settlement in small villages in the coastal zone.

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OIL AND GAS

GROWTH OF STREZHEVOY AS OIL PRODUCER

Tallinn MOLODEZH ESTONII in Russian 7 Aug 85 p 3

[Article by E. Grintsov: "High Calling: City in the Oil Belt"]

[Text] That's Strezhevoy, a city which became the headquarters for oil and gas workers in the Tomsk Oblast. It has already surpassed Azerbaydzhan in "black gold" production. Young men and women from our republic will be going there at the end of August as members of an elite All-Union Komsomol "Stakhanovets" detachment.

Vasiliy Ivanovich Matyutin speaks about Strezhevoy with enthusiasm and, very likely, endlessly. It's not hard to imagine that he loves this city.

"And how could it be otherwise? Strezhevoy practically grew up before my eyes. I arrived in 1973 after graduating from an institute in my native Omsk--I'm also a Siberian. Strezhevoy was a worker's settlement with a population of about 10,000. There and then this entire oil- and gas-producing region of Western Siberia began to grow. Novyy Urengoy had only just begun and nothing had been heard of Yamburg, Noyabrsk or Megion--they weren't even on the oil maps. Of course there were few houses in Strezhevoy then, and you could say we didn't take our boots off for months since there was no asphalt. But the enthusiasm, drive and commitment of our youth were strong. Strezhevoy grew and we matured with it."

Vasiliy Ivanovich Matyutin is the deputy administrator of the Tomskgazstroy [Tomsk Gas Industry Construction] Trust. A few days ago he traveled to Tallinn in our republic to meet with workers of the Estonian Leninist Communist Youth Association Central Committee to resolve organizational questions concerning the dispatching of an elite unit from the republic to Western Siberia.

"Now, of course, Strezhevoy, which was awarded city status in 1978, would be hard to recognize. Asphalt, flowers and trees are everywhere. It is a green and beautiful city which is very well built. New apartments have grown up on the sites of old ones. There are nearly a thousand young Siberians growing up in the city. Four microrayons have been completely finished. They contain all the necessary social and cultural facilities. In accordance with the general plan for Strezhevoy's development (which incidentally provides for a doubling

of the city's population in the coming years), a fifth microrayon is under construction. It will primarily consist of nine-story apartments."

It is not surprising that the city will be growing at a rapid pace. Right now there are three primary oil and gas fields in the region: Strezhevskiy, Vasyuganskiy and the newest, Pudinskiy. New fields are being opened nearly every year and a new method is being used to develop them: the extended-shift technique. Oil workers are taken by helicopter from Strezhevoy to duty stations for a 15-day shift. These stations (a second home for the oil workers) have nothing but the essentials, but are surprisingly comfortable. When leaving for his multi-day shift the worker knows that he'll have a good opportunity to rest with his family on his return to Strezhevoy. So, Strezhevoy is a headquarters from which the oil and gas workers advance on their objective. The Tomskgazstroy Trust, based in Strezhevoy, builds all the facilities needed in a large area: from Tomsk to Tyumen.

The trust's 4000-member collective will soon be supplemented by Komsomol volunteers from Estonia and other republics and oblasts of our country. As soldiers in the elite All-Union Komsomol "Stakhanovets" detachment they will work on the development of oil and gas fields in the Tomsk Oblast.

Tomskgazstroy is a trust with a good reputation, well-known and respected in the North not only for its production successes (for example, in the first quarter of this year it achieved first place in the All-Union Ministry), but also in caring for its people. Tomskgazstroy has its own cultural center, movie theater, sports hall, «ki facilities, Pioneer camp (on the Black Sea) and supply system which provides builders with vegetables, meat and other products. It has its own professional/technical training center and a branch of the Tomsk Engineering and Construction Institute where learning can take place without interrupting production and without leaving Strezhevoy. Here and everywhere, the doors of all the oblast's VUZ and tekhnikums are open to construction workers.

One detachment of young people working in the areas of business and public food supply came to Strezhevoy from Estonia two years ago. The kids fell in love with the city and with the unusual beauty of nature in Siberia. We in Strezhevoy were happy with their work and now the city is preparing to receive a new group. We say "Welcome" to them.

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OIL AND GAS

HOUSING CONSTRUCTION PROBLEMS IN THE OIL INDUSTRY

Moscow NEFTYANIK in Russian No 4, Apr 85 pp 40-41

[Article by I. Boyeva: "The Non-Existent New Settlement" under the rubric:  
"Oil Workers' Life and Leisure"]

[Text] Housing construction is a major social and economic question. How is it handled in this sector? The oil and gas workers' towns of Kogalym, Nefteyugansk, Nizhnevartovsk and Strezhevoy are growing and improving. According to current data, last year oil workers received 1,279,700 square meters of living space. The figure seems impressive. Sector workers are short nearly 207 thousand square meters of living space and polyclinics and kindergartens have not been opened. Plans for allocating capital investments for non-production construction have not been carried out. Just what is preventing regular and timely completion of these facilities?

We recall a conversation with Anatolyy Timofeyevich Rogov, chairman of the Zavolzhskiy Oil and Gas Extraction Administration's trade union committee. Having sufficiently admired the new multi-story apartment buildings and the green streets of the town of Stepnoye which rises out of a waterless plain, I still wanted to better understand what was behind the collective's successful and steady work and I asked Rogov about production.

"Well, social and housing questions are foremost with us," Anatolyy Timofeyevich answered half-seriously and half-jokingly.

Where there is good, modern housing workers will prosper. In places where this fact is taken to heart, new houses, kindergartens, child care facilities, schools and hospitals are being built and streets are being put in good order. Today the link between production and living facilities is so strong that it can no longer be ignored. But there are still managers for whom production is the first, second and third order of business. Of course they do not often think of a live, individual person and his concerns or needs. It's no wonder that these managers have a high personnel turnover, cannot recruit any young people and are short of qualified specialists.

Of course, builders have many problems: there isn't always enough equipment or materials and often there aren't enough specialists and workers. In some cases planning is inadequate, in others designers have made mistakes and in yet other cases management is poorly organized and has adopted a "paper shuffling" style of leadership. So instead of solving problems some managers have become accustomed to difficulties and find "objective reasons" for them.

We all know the solution to this situation: it lies in strict and realistic planning, in expanding capabilities, in introducing well-recommended team contracts and, of course, in strict control over the job.

The Groznyy, Ukrainian, Tatar and Orenburg Petroleum associations are examples of the best and can build high quality housing rapidly as needed. For this to be accomplished the organization policy and work must be carried out jointly. But this is not done everywhere. The Noyabrsk, Krasnoleninsk and Nizhnevartovsk petroleum associations have allowed the greatest lags in opening new housing.

Meanwhile the Tyumen Oblast CPSU Plenum has noted that fundamental changes are required in the work of the construction organizations. The construction of housing and other social and cultural facilities is especially poor. In four years of the five-year plan, enterprises in the complex have been short hundreds of thousands of square meters of living space, preschool facilities, hospitals and technical training centers.

Any construction project involves a number of relationships among affiliated entities: clients, design organizations, builders and suppliers of materials and equipment.

The Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] is the prime contracting agency for oilfield projects involving non-production facilities. Specialists at the Ministry of the Petroleum Industry's Capital Construction Administration's Production Dispatch Department have stated that nearly half the annual living space construction allocation (740,700 square meters) is for the Minneftegazstroy. However the main contractor has been working in the red, with oilworkers facing a living space deficit of 122 thousand square meters. Kindergarten shortage totals include: 280 seats in Nefteyugansk, 50 seats at the Kedrovaya Petroleum Pumping Station and 50 seats at the Ilichekevka Petroleum Pumping Station.

Why has this occurred? The Minneftegazstroy's successes are well known. For example, in its 24 December 1984 issue the "Pravda" newspaper noted that in a number of the ministry's subunits building the pipelines from Urengoy to the center of the country team composition and work rates were being determined on the basis of the productivity of the basic machines used. Here they introduced the collective contract and prepared job productivity estimates in advance. This allowed planning deadlines to be met ahead of schedule and resulted in high quality primary pipelines.

Maybe the prime contractor thinks it's in the pipeline business and housing/social facilities are to be built on a "catch-as-catch-can" basis?

"There are several reasons and, of course, they are completely different" was the answer I received at the Minneftegazstroy's Housing and Civil Construction Administration. "We have subcontractors who also carry out non-production construction for oilworkers, although on a smaller scale. For example here's the situation in Western Siberia: the USSR Ministry of Construction is 21 thousand square meters under the plan for living space, the USSR Ministry of Power and Electrification is 6,500 square meters below target and the USSR Ministry of Construction of Heavy Industry Enterprises is 18,000 square meters below the housing space goal. They complain of people shortages and design deficiencies. Unfortunately sometimes even the customer puts a stick in our wheel. For example, in order for us to plan corrections and revisions, if any (and there is always a need for corrections), for the current year, our customers must deliver project-by-project requests by 15 February. We received this documentation some time ago from the Ministry of Geology and the Ministry of the Gas Industry. It's the end of February and there is still nothing from the oil people."

The prime contractor has other grievances against its customers. A new and improved housing design is being used to speed construction throughout the country. Everyone benefits from this: the residents enjoy comfortable apartments and builders claim that the new buildings are assembled instead of constructed. However, the Main Administration of Petroleum Transport stubbornly clings to brick construction although the customer knows that funds for bricks have been limited and this almost inevitably delays construction. As a comparison: only 10 percent of the buildings constructed for the Ministry of the Gas Industry are of brick while 25 percent of those built for the Ministry of the Petroleum Industry are of brick.

Housing and Civil Construction Administration specialists showed me a telegram which in their opinion well illustrates the relationship between the customer and prime contractor. The gist of it was as follows. In September of 1984 the Krasnodar Pipeline Construction Association opened a 3,100-square meter housing facility in the settlement of Melovoye, Voroshilovgrad Oblast. The boiler room was built by the customer--the Main Administration of Petroleum Transport's Dneprovsk Pipeline Administration. The customer guaranteed heat supply from the moment the building was opened. However, by the beginning of December there still was no heat and this opened up the possibility of other building systems freezing. The people waited impatiently to move in and the building stood empty for months.

As we see, all the links in the process--the customer, designer and contractor--are not always acting in concert to achieve the main goal of timely living space introduction. The prime contractor's role and authority must be increased to help it in its work and to strengthen its supervision at the same time.

Every construction project manager complains of a lack of building materials, nails, bricks, etc. It would be beneficial for the customer and contractor to examine progress in other department-external matters, because reserves must first be sought in their own management in order to improve the technical, economic and organizational sides of housing construction. It is time the customer and prime contractor broke through the interdepartmental barriers and

found a common language. Construction is one sector in which high quality can only be achieved when all participants play a conscientious part in the process.

In an decree entitled "On the Letter from Construction Team Members" published under the headline "A Word in Honor of Builders" in "Pravda" on 8 September 1984, the Central Committee of the CPSU demanded "...steady, year-round production of housing and other social facilities. All measures are to be taken to avoid rush work in the introduction of housing, which leads to alterations, waste and non-productive expenditures of state resources."

The decree emphasized that the fundamental improvement of the quality of housing and civil construction is the most important economic, managerial and social task which meets the interests of a broad spectrum of the population.

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1822/10

OIL AND GAS

UDC 622.24.(03).019.941

NEW REFERENCE BOOK EXAMINES LATEST DRILLING TECHNIQUES

Moscow RAZVEDKA I OKHRANA NEDR in Russian No 8, Aug 85 p 62

[Review by A. I. Lager of the Krasnoyarsk Non-Ferrous Metals Institute of book "Spravochnik Inzhenera po Bureniyu Geologorazvedochnykh Skvazhin" [Engineer's Handbook on Geological Exploratory Well Drilling] under the general editorship of Ye. A. Kozlovskiy, UDC 622.24.(03).019.941: "Reviews and Bibliography: A Handbook on Drilling Geological Exploratory Wells"]

[Text] The "Engineer's Handbook on Geological Exploratory Well Drilling" was issued in 1984 by the NEDRA Publishing House with Ye. A. Kozlovskiy as general editor. In connection with the creation of powerful new drilling machinery, drilling tools, means of mechanizing support operations and the development of progressive drilling technology, it was necessary to carry out the systematization, generalization and analysis of new data, which was the aim of preparing the new drilling handbook. The handbook consists of two volumes. Basic material is set forth in the first volume in four sections. In the first section, data is cited on drilling as a form of geological exploratory operations, the classification of rock and on geological and technical conditions and methods of drilling for solid mineral resources. The second section contains information on general-purpose equipment for drilling geological exploratory wells and measuring and monitoring drilling parameters, as well as the mechanization of support operations; on drill and casing pipe; and, on diamond and hard-alloy drilling tools and drill bits for non-core drilling. Also included in this same section is data on measures to increase the wear resistance of drill pipe strings, well testing equipment and tools to eliminate drilling accidents.

The third section describes specialized equipment for well drilling: core extraction using detachable core apparatus or an ascending current of a flushing liquid, bottom-hole hydropercussion machinery and with compressed-air purging, for drilling in soft and loose rock without the use of cleansing agents and for directional and multiple-bottom drilling, as well as tools for mechanical churn drilling. The fourth section contains information on powering drilling equipment and energy supply for geological drilling; various types of electric drive for drilling equipment and methods of selecting and evaluating power supplies are shown here.

The second volume contains the next two sections. The fifth section describes drilling technology: rotary using diamond drilling tools, percussion-rotary

using hydropercussive machinery, core extraction without raising the drill pipe string, non-core drilling, churn drilling, drilling with compressed-air purging and soft and loose rock drilling without the use of well cleaning devices. Information is presented on cleansing agents and the methodology and technology of directional and multiple-bottom drilling, as well as drilling from underground rooms and methods of eliminating accidents and complications. Questions of controlling the drilling process are reviewed. The sixth chapter is devoted to questions of economics and the organization of geological exploratory drilling. Conditions for the effective use of progressive drilling methods and equipment and issues in planning and organizing drilling operations, protecting the environment and of labor in geological exploratory drilling are described. At the end of this volume are supplements that include an accounting card for drilling operations, samples of punched cards, order forms for conversion to team contract conditions, drilling team work fulfillment agreements, team contract production orders, questionnaires for drilling team quality evaluations and cost-accounting commission summaries, as well as a list of the standard documents on labor protection required for geological organizations.

Overall, the handbook under review embodies the great labor of the authors who collected, systematized and analyzed an enormous amount of factual material on modern practice of drilling geological exploratory wells, reflecting the development of scientific and technical progress in this sphere. The handbook is written on a high scientific level. Particular attention is devoted to fundamental scientific research, general design solutions and the achievements of production organizations and outstanding production workers. A new trend is reviewed--the control of geological exploratory drilling operations incorporating drilling process modelling and the creation of econometric models. This provides the possibility of analyzing the drilling process excluding subjective factors that could influence the quality and effectiveness of drilling. A clear logical connection is observed in the book's structure: its sections and chapters are complete explanations and, at the same time, supplement one another. Numerical data is systematized and collected into tables in a felicitous manner (there are 161 tables in the first volume and 116 in the second), and all explanations are well illustrated (there are 225 illustrations in the first volume and 124 in the second).

The handbook is intended for technical and engineering workers involved in well drilling for solid mineral resources and for specialists in scientific-research and design organizations; it will undoubtedly be exceedingly useful to instructors and students in higher and secondary educational institutions of the appropriate type.

12821  
CSO: 1822/81

OIL AND GAS

BRIEFS

**GOSSTANDARD SANCTIONS ON MOBILE HOMES**--Gosstandart [State Committee for Standards] has tested the construction quality of mobile homes produced according to the Ministry of Construction of Petroleum and Gas Industry Enterprises's northern design version by the Volokamsk plant. These mobile homes are used as living quarters for those working on pipeline surveying and pipelaying projects. Serious violations of standards were found. Nearly two out of every three requirements for mobile homes as set forth in standards documentation were not being met by the plant. Metal surfaces are being painted without prior priming, frame and outer shell components are not being coated with an anticorrosive and wooden parts are not being dried and sterilized prior to use. The organization and execution of production work do not support proper quality product output. The plant has been forbidden from producing this line and 2,720 mobile homes for a total of 10.4 million rubles have been removed from plan performance calculations. This results in a 1.98 million-ruble state budget revenue loss. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 28, Jul 85, p 8] 12746

CSO: 1822/10

COAL

UDC 067 "IGI":622.33.013.001.5

**SYNTHETIC FUELS, NUCLEAR POWER COMPARED**

Moscow UCOL in Russian No 9 (714), Sep 85 pp 19-23

[Article by L. V. Semenov, candidate of economic sciences (IGI) Institute of Mineral Fuels : "Coal at the Threshold of the Third Millennium"]

[Excerpts] In the last quarter of the 20th century the planetary, global nature of the impact of man's industrial activities on natural resources has become an unquestioned fact. Mankind has approached the point where depletion has begun of several minerals -- of the material-energy foundation on which civilization is built. The main problem in utilizing fuel resources has become that of comprehensively economizing oil resources, reserves of which are rapidly diminishing. Great importance has been assumed by the development of resource saving technology, wider utilization of nuclear power and coal resources, and the production of liquid fuel from coal.

Coal and nuclear power. In current scientific parlance, the fuel-energy (energy) complex (TEK) of a country is an aggregate of large systems, which constantly grow in complexity and size. The USSR's TEK is comprised of the systems of: coal supply, oil supply, gas supply, electric power (including centralized heat supply) and nuclear power. Innumerable studies and accumulated practical experience demonstrate that the future development of fuel supply systems is determined both by external conditions (the national economy's demand for fuel and energy and the interchangeability and relative efficiency of the various types of them), and by the internal parameters of each system -- the geological and ready-for-exploitation reserves of fossil fuels, and their qualitative characteristics.

In the country's fuel-energy economy coal is the most important and reliable energy carrier. Based on the results of the fourth all-union computation of predictable reserves of coal for the entire territory of the USSR, an estimate of them was published, both in natural terms and translated into standard fuel (Table 1).

Table 1

Уголь 1)	Общие геологические запасы (ресурссы) 2)			Разведанные 7)		
	всего 3)	в том числе 4)		Балансовые (резервы) 8)		забалан- сочные 9)
		кondици- онные 5)	некондици- онные 6)	A+B+C <sub>1</sub>	C <sub>2</sub>	
10) Натуральное топливо, млрд. т						
Все 11)	6806	5609	1197	281	138	135
Каменные 12)	4649	3823	826	171	87	91
Бурьи 13)	2157	1786	371	110	51	44
14) Условное топливо, млрд. т						
Все 11)	5271	4422	849	201	103	87
Каменные 12)	3887	3235	652	146	75	69
Бурьи 13)	1384	1187	197	55	28	18

## Key:

- |                              |                                 |
|------------------------------|---------------------------------|
| 1. Coal                      | 8. Balanced                     |
| 2. Total geological reserves | 9. Outside balance              |
| 3. Total                     | 10. Natural fuel, billion tons  |
| 4. Including                 | 11. Total                       |
| 5. Standard                  | 12. Hard                        |
| 6. Non-standard              | 13. Lignite                     |
| 7. Explored                  | 14. Standard fuel, billion tons |

The data in Table 1 are evidence that our country is very well provided with coal resources. Proceeding on the basis that one billion tons of coal will be mined annually, then the explored balanced reserves in Categories A+B+C<sub>1</sub> alone will be adequate for more than 200 years. Predictable reserves of coal far exceed predictable reserves of oil and natural gas. Moreover, we must expect a gradual reduction in the share of oil in the fuel-energy balance, and that it will be used mainly as raw material for chemical and microbiological products. Since the share of natural gas consumed in this period will be substantially unchanged, the entire shortage in the fuel-energy balance will be covered by increasing the use of coal and by substantial growth in the share of nuclear power from thermal- and fast-neutron reactors, and, in the future, of thermonuclear power.

The increase in the output of electric power in the current five-year plan has come about mainly by utilizing coal and nuclear fuel, as well as hydroelectric resources. Calculations show that 1 million kW of installed capacity at an AES make it possible to save more than 2 million tons of standard fuel per year. As a result of developing the output of electric and thermal power at AES and at nuclear heating supply plants, in the next few years there will be a considerable reduction in the annual consumption of boiler fuel at power plants. The reliability, economic effectiveness and requisite security of fast-neutron AES have now been proven. We are now at the stage of experimental testing and search for the optimum engineering solutions for fast-neutron reactor technology. In analyzing the future development of nuclear and thermonuclear power, Academician A. P. Aleksandrov has pointed out that the nucle-

ar fusion of light elements -- thermonuclear synthesis -- is accompanied by the escape of neutrons, a portion of which can be captured by uranium 238 to produce plutonium. Hybrid thermonuclear reactors can be set up for this.

Calculations show that investment in the fuel cycle for AES is 20-35 percent higher than for coal-fired GRES of the same capacity, and the production cost of the power they produce is 5-15 percent lower. This is also confirmed by the actual operation of nuclear power plants in the European part of our country. With the increase in capacity of AES units up to 1 million kW, the nuclear plants in the European part of the USSR have become more economical than thermal power plants operating on any other type of fuel. To arrive at the optimum directions for the electric power supply of those areas of the country located west of the Urals that are short of energy sources, economic correlations have been made of the possible alternatives. The results of these calculations, which have taken account of all national economic outlays for the extraction, production and transportation of fuel and electric power, are shown on the left side of Table 2, in which the costs incurred are attributed to electric power and net capacity in the area of consumption. The calculations have demonstrated that only electric power transmitted from Ekibastuz GRES in any way approaches the economic effectiveness of that produced by AES. The utilization of nuclear energy in the country's European part for heating supply is highly efficient. Since it is now a matter of acute interest to utilize for this purpose, not only nuclear energy and natural gas, but also Donetsk coal and fuel oil, the right side of Table 2 provides indicators on the economics of utilizing these energy carriers as well. District heating facilities with VVER /water-moderated water-cooled/ type reactors have been operating successfully for a long time in the European part of the country.

Table 2

Источник электроснабжения 1)	Приведенные затраты. 2) %	Источник теплоснабжения 3)	Приведенные затраты. 2) %
4) АЭС на тепловых нейтронах	100	АТЭЦ	100 8)
5) ГРЭС в Экибастузе и передача электроэнергии	102	Котельная на газе с выработкой электроэнергии на АЭС	125 9)
6) ГРЭС на газе в Тюменской области и передача электроэнергии	110	ТЭЦ на донецком угле	172 10)
7) ГРЭС в центральном районе на кузнецком угле	113	ТЭЦ на мазуте	192 11)

Key:

- |   |   |
|---|---|
| 1. Source of power supply   | 7. Kuznetsk-coal-fired GRES in central region     |
| 2. Costs incurred, %  | 8. Nuclear TETs                                   |
| 3. Source of heat supply  | 9. Power-generating gas-fired boiler plant at AES |
| 4. Fast-neutron AES   | 10. Donetsk-coal-fired TETs                       |
| 5. GRES in Ekibastuz, plus power transmission                       | 11. Oil-fired TETs                                |
| 6. Natural-gas-fired GRES in Tyumen Oblast, plus power transmission |   |

In contrast to the European part, in the majority of the eastern areas of the country GRES and TETs operating on Ekibastuz, Kuznetsk and Kansk-Achinsk coal are economically effective. In the Urals, with electric power supplied from GRES operating on Ekibastuz coal, and heat from TETs operating on Kuznetsk coal, the costs incurred are 10-20 percent lower than to produce these energy sources at AES and nuclear TETs. The utilization of the energy in coal is even more effective in areas of Kazakhstan and Siberia.

**Outlook for coal chemistry.** The national economy's need, not only for comprehensive economy and savings in oil, but also for the development and future production of synthetic liquid fuel, can be judged by comparing the long-run marginal costs /zamykayushchiye zatraty/ for the principal types of organic fuel -- coal, oil and natural gas. Long-range marginal costs are defined as the system of interrelated specific economic indicators for expenditures in the national economy to satisfy additional demand for various types of fuel and energy by areas of the country. These indicators are defined by the result of optimizing the development of the TEK for a term of up to 20 years, and they ensure the selection in numerous partial technical-economic calculations of the alternative solutions that give a view of them when the fuel-energy balance as a whole is optimized. While the long-range marginal costs for oil are at nearly the same level in the European part of the country as in Central Siberia, for coal they differ by a factor of 3.8. The most important and economical reserves of coal suitable for open-pit mining are concentrated in Central Siberia within the bounds of the Kansk-Achinsk Basin. For total geological reserves of coal this is the country's major basin. All 24 coalfields identified in the basin have a thick lignite seam of a basically simple structure and in either a horizontal or gently sloping (about 2-9°) deposit from 6-96 meters thick. It should be noted that it is not only economic criteria, but also its qualitative features that make Kansk-Achinsk the optimum raw material for destructive hydrogenation processing. The method of destructive hydrogenation is the most effective means of converting an organic coal mass (OMU) into liquid products without preliminary gasification of the solid fuel, which is inevitable with any of the other means of obtaining liquid products from coal -- syntheses based on an oxide of carbon and hydrogen.

The qualitative features and properties of Kansk-Achinsk coal have been sufficiently well studied as a result of research and processing of them in the laboratories of IGI. It has been discovered that they have a low degree of metamorphism, and that the coal at several fields of the basin are low in fusainized components. With a reduced amount of the latter, the degree of liquefaction of an organic coal mass during hydrogenation processing increases virtually linearly. Chemical research on Kansk-Achinsk coal has demonstrated that the reactivity of an organic coal mass when undergoing reduction destruction depends on its structural features, and specifically on the forms of the bonds between the elements. The depth of conversion of an organic coal mass undergoing hydrogenation is proportional to the content in its structure of hydrolyzed fragments, and the intensity of liquid product formation is directly dependent on hydrogen and alkyl cross-linkage bonds. The presence of quinoid groups in the basin's coal increases the effectiveness of its hydrog-

tion processing.

IGI research has established the presence in the coal at several fields of the Kansk-Achinsk basin of trace elements that have a catalytic effect, which thereby intensifies the conversion of the raw material.

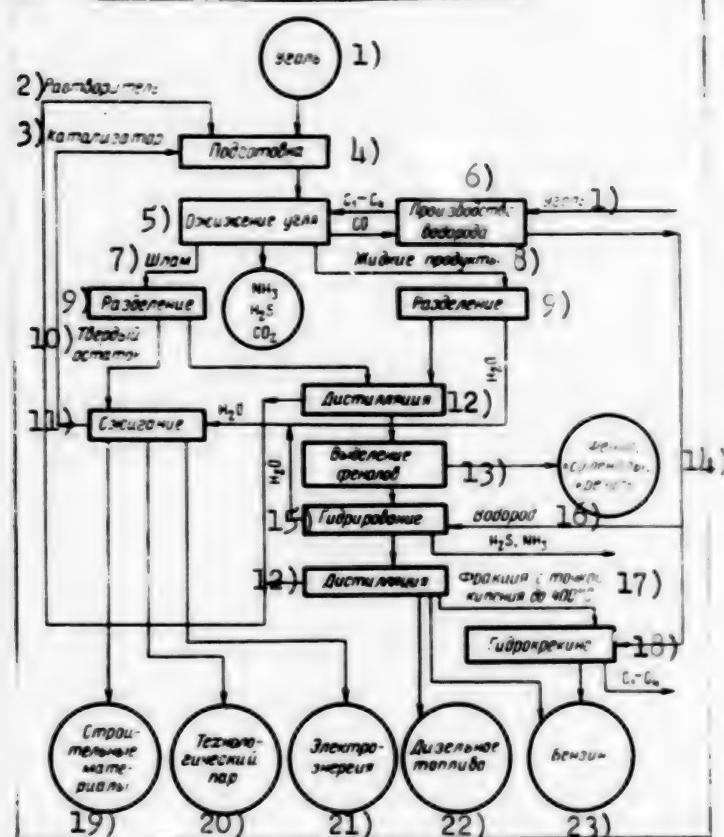
The scale of development of the Kansk-Achinsk basin will be determined by two basic future requirements for coal -- by heat and power plants, the power from which must be transmitted to Western Siberia, the Urals, or farther, and by enterprises producing synthetic liquid fuel (SZhT).

IGI scientists have performed a series of studies in the field of the technology of the future production of liquid fuel from the basin's coal. A wholly new approach has been developed to increase the efficiency of the hydrogenation process in order to intensify the liquefaction of an organic coal mass at a hydrogen pressure of about 10 MPa, instead of the 30 MPa and more previously employed (Figure 1).

The result of many years of research has established that the maximum catalytic effect is obtained from mixtures of compounds of molybdenum, bivalent iron and sulfur, the use of which in small quantities makes it possible to achieve intense liquefaction of an organic coal mass, and to obtain low-molecular products. The means of applying the catalyst is of great importance in this connection. Vibration milling of the coal with the catalyst salts, and the use of an emulsion with added elemental sulfur are effective.

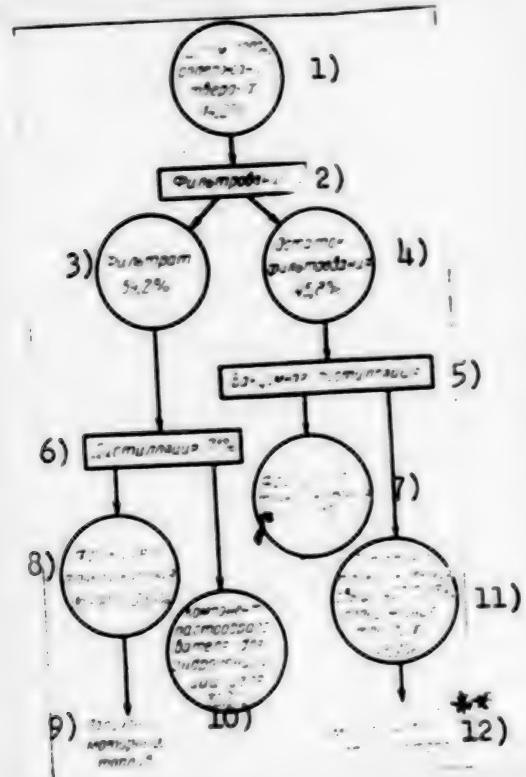
An essential condition for the profitability of the process of coal hydrogenation is the reuse of a highly effective molybdenum catalyst and the utilization of the potential thermal energy of the organic coal mass contained in the slurry residues. Processing the slurry is a complex stage in the overall process of obtaining liquid products from coal. In the procedure developed by IGI (Figure 2) it proceeds in two stages: centrifuging the residue with a solid content of about 30 percent, and vacuum distillation and combustion of the residue with a solid content of about 50 percent, for the regeneration of the molybdenum.

**Figure 1. Basic Procedure for Obtaining Liquid Fuel from Coal by the IGI Method**



- Key:**
- |                         |   |
|-------------------------|---|
| 1. Coal                 | 13. Separation of phenols                         |
| 2. Solvent              | 14. Phenol, kislenols, creosols                   |
| 3. Catalyst             | 15. Hydrogenation                                 |
| 4. Preparation          | 16. Hydrogen                                      |
| 5. Liquefaction of Coal | 17. Fractionation with boiling point up to 400 °C |
| 6. Hydrogen generation  | 18. Hydrocracking                                 |
| 7. Slurry               | 19. Construction materials                        |
| 8. Liquid products      | 20. Industrial steam                              |
| 9. Separation           | 21. Electric power                                |
| 10. Solid residue       | 22. Diesel fuel                                   |
| 11. Combustion          | 23. Gasoline                                      |
| 12. Distillation        |   |

Figure 2. Procedure for Processing Coal Slurry



Key:

- 1. Slurry 100%  
Solid content 14.2%
- 2. Filtration
- 3. Filtrate 54.2%
- 4. Filtration residue 45.8%
- 5. Vacuum distillation
- 6. Distillation 71%
- 7. Fraction with boiling point  
up to 400 °C 16.8%
- 8. Fraction with boiling point  
up to 400 °C 33.4%
- 9. Production of motor fuel
- 10. Paste forming ingredient from  
hydrogenation of coal 32.6%
- 11. Residue with boiling point  
above 400 °C Solid  
content 48.9%
- 12. Regeneration of molybdenum  
catalyst

Because of the low molybdenum content of the slurry during recovery, it must first undergo enrichment. In the IGI procedure this is accomplished by a very simple and effective method -- in an arrangement with high-temperature combustion of the slurry in the form of a dispersed fuel system. Under the impact of high temperatures and an oxydizing medium, the molybdenum compounds are oxidized to molybdenum trioxide, which sublimates and exits from the furnace with the gaseous products of combustion. With the cooling of the combustion products  $\text{MoO}_3$  condenses on the fly ash. Since the mass of the latter is considerably less than the mass of the initial fuel (slurry), ash effluents enriched by molybdenum are obtained. After recovery of the molybdenum by hydrometallurgical methods, it is reintroduced into the process. The thermal energy obtained from the combustion of the slurry can be used to generate electric power or industrial steam, and the ash, for the production of

construction materials.

A large-scale experimental facility for the hydrogenation of ST-5 solid fuel has been built in our country for the experimental-industrial development of the new method of processing coal. It is well known that the unit capacity of industrial oil refineries can reach six million tons per year. Reducing the pressure at the basic stage of the process of coal liquefaction to 10 MPa, and improving the preparatory and concluding operations of the industrial cycle has opened up possibilities of setting up aggregates of great unit capacity in coal chemistry as well.

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CSO: 1822/46

COAL

UDC 622.237.72"77":622.031.22-118(477.61/.62)

#### MECHANIZED COAL EXTRACTION IN CENTRAL DONBASS REGION

Kiev UGOL UKRAINY in Russian No 7, Jul 85 (signed to press 27 Jun 85) pp 6-8

[Article by V.G. Goryachiy and V.A. Kodenko, engineers, Gorlovka Branch, DonUGI: "Mechanization of Coal Extraction in Extremely thin, Steeply Sloping Seams in the Donbass"]

[Text] Extremely thin (with a thickness of 0.7 m or less), steeply sloping seams constitute about 40 percent of the total amount of workable steeply sloping seams in the central part of the Donbass. In order to mechanize mining operations on these seams it is necessary to have small and reliable extraction equipment. The most acceptable suitable method is a technological system with the periodic presence of people at the working face, for which it is necessary to have an extraction machine fitted with a system for remote control from the vent drift.

The Gorlovka branch of DonUGI [Donets Scientific Research Institute of Coal] was given an assignment: develop facilities for mechanizing the extraction of coal in the central part of the Donbass, including extraction from steeply sloping seams 0.3-0.7 m thick. As a result of the performance of scientific research (on a specimen of the Malysh-69 extraction machine, which was developed by the Artemugol Combine's SKO [Serial Production Design Department]) and planning and design work, plans for the Malysh-71 combine were finished in 1971. Several assemblies and parts in it were of a new design: a strengthened actuating member was created, with improved I80B teeth instead of ZN2-5.5, and the support on the face was eliminated; in a reduction gear, a gear clutch was installed at the junction of the motor's shaft with the reduction gear's first shaft, a clutch-switching mechanism was built into it, and the lubrication system was improved; the combine's bed and the assemblies for attaching the reduction gear to it were strengthened.

In 1972-1973, 12 Malysh-71 combines were built and adopted for industrial use. On the basis of the experience that was accumulated and research work, the working plans were amended. The combine was given the name Malysh-73. In connection with the appearance in series production of the more powerful K18F1-25 compressed air motor in place of the K2F and the new I90 cutting teeth, a special adjustment was made. Changes corresponding to the latest requirements were introduced into the reduction gear, bed, hitching unit and actuating member. The combine received the name Malysh-74. The use of more

reliable teeth and a more powerful motor led to an increase in the strength of the actuating member, the reduction gear, the bed and the hitching unit, as a result of which the diameter of the actuating member (including the teeth) was 300 mm and the height of the combine's housing was 280 mm.

In all, 30 Malysh-73 and Malysh-74 combines were built, including 6 Malysh-74 combines for export. Their industrial use confirmed the correctness of the parameters that had been established and the combines' efficiency. At the Dzerzhinskugol Association's Mine imeni Artem, the maximum monthly extraction rate in 1975 was 4,978 t and at the Mine imeni Dzerzhinsky it was 4,250 t; the average monthly rates were 3,460 and 2,800 t of coal, respectively.

Despite the advantages of the Malysh-74 combine, it had some inherent flaws that are typical of machines of this type: the impossibility of regulating the actuating member's position according to the thickness of the seam, which limits its use on seams 0.3-0.5 m thick that have strong cohesion of the upper block of coal with the immediate ceiling; inadequate power, which limits its use on seams with a complex structure and coal of above-average hardness that have inclusions of pyrite and other hard rock interlayers; the large overall length of the combine when the counterweight is taken into consideration. The counterweight did not fully fulfill its functions on longwalls with a face line slope of more than 15° from the vertical and it increased the combine's length by more than 1 m.

As a result of an extended creative search, a solution was found for shortening the combine's length and improving its stability. A counterweight of variable weight was placed on the bed in the zone between the face and the reduction gear, and the capability of regulating the counterweight's position with respect to the strike of the seam was provided. This solution makes it possible to regulate the position of the combine's center of gravity and its weight depending on the seam's angle of incidence and the face line's slope.

The new combine that was developed on the basis of the Malysh-74 (and given the name Poisk-1) was fitted with an improved actuating member (in two versions) with I90MB and RKS1 teeth, as well as a more powerful drive from a small EKV 2.5--30-U5 electric motor, which has a housing height of 260 mm and a 30-kW capacity. The combine's design provides for forward and rear skids that rest on the ground and can be adjusted vertically, which provides partial regulation (up to 20 mm) of the actuating member relative to a seam. In 1979 the Poisk-1 was confirmed for series production at DonUGI's Gorlovka Experimental Plant on the basis of statements from production associations.

Combines of the Malysh and Poisk-1 type are used basically to work secondary seams that shield seams of working thickness. The removal by the combines of extremely thin seams provided protection for more than 9 km of seams in the Gorlovskaya, Almaznaya and Kamenskaya formations where there was a danger of blowout, and made it possible to extract additionally about 1 million t of high-quality coking coals.

In 1984 the average monthly rate of extraction by the pneumatic version of the Poisk-1 combine was 3,220 t (at the Artemugol Association's Aleksandr-Zapad

Mine), 2,940 t (Dzerzhinskugol's Mine imeni Artem) and 3,620 t (Ordzhonikidzeugol's Krasnyy Oktyabry Mine).

Further improvement of the equipment for working extremely thin, steeply sloping seams led to the creation of a combine with two motors and an actuating member consisting of two cutting drums (bars) that are regulatable over the entire thickness of a seam. Since 1975 the Gorlovka Branch of DonUGU has been engaged in developing a new model of an extraction machine for extremely thin, steeply sloping beds; it is called the Poisk-2.

The Poisk-2 has a reduction gear with two symmetrical transmissions that are enclosed in a single housing, on the ends of which there are rotary reduction gears with cutting drums. The upper rotary reduction gear (along the machine's path of movement) is fitted with a hitch device that contains the control elements for the hydraulic and spraying system; in addition, the traction (working) and safety cables are attached to it. The chamber containing the hydraulic system's working liquid, which has a built-in hydraulic pump unit, is located along the reduction gear's transverse axis of symmetry. On both sides of the hydraulic system's chamber there are half-opened apertures where pneumatic or electric motors are installed. Between the face and the reduction gear's wall there is a gap 350 mm wide for the movement of coal dislodged by the upper drum, and there is a support device on the bed. In order to improve the movement and crush improperly sized pieces of coal and collapsed rock, gummers are mounted on the reduction gear's rear wall. After the development, production and testing of the Poisk-2's experimental assemblies in 1976 and the building of a prototype in 1978, four machines were manufactured for industrial testing. In parallel, in 1978-1979 a special SIP [expansion unknown] stand was built to work out the parameters of the combines being planned. Tests confirmed the correctness of the parameters that were adopted, and in 1981 the Poisk-2 was turned over to the Gorlovka Machine Building Plant imeni Kirov for series production.

At the present time, Poisk-2 combines with pneumatic and electric drives are in operation in the Artemugol, Dzerzhinskugol, Ordzhonikidzeugol, Pervomayskugol and Krasnodonugol associations. It should be mentioned that it has been possible to achieve the constant extraction of 200-250 t per day with the pneumatically driven combines only at those mines where the pressure of the compressed air for the extraction machine is at least 0.3 MPa and a flow rate of at least 40 m<sup>3</sup> [sic] is provided.

The combines are being operated successfully in various associations. For instance, at the Kochegarka Mine (Artemugol), which is working an Anatolyevskiy seam 0.22-0.5 m thick, 3,526 t of coal were extracted in January 1985 and the plan was overfulfilled by 414 t. At the Mine imeni Dzerzhinskii (Dzerzhinskugol), which is working a Kulaga seam 0.51-0.57 m thick, in January 1985, 4,214 t were produced, overfulfilling the plan by 162 t; at the Donetskaya Mine (Krasnodonugol), which is extracting coal from a seam 0.45-0.8 m thick, 4,607 t were produced in January, which overfulfilled the plan by 987 t. Coal was extracted from the prisechka [translation unknown] of the side walls at the Kochegarka Mine and the mines imeni Izotov, K. Marks and Artem. All these combines are fitted with pneumatic drive and operate at a compressed air pressure of 0.28-0.42 MPa.

Item	Malysh-69	Malysh-71	Malysh-73	Malysh-74	Poisk-1p	Poisk-1e	Poisk-2p	Poisk-2e
Calculated productivity, t/min	0.8	1.0	1.0	1.0	1.5	2.0	2.0	2.5
Actuating member diameter, mm	275	280	300	300	300	400	300	400
Limit of regulation of height of lagging drum, mm:								
Lower limit, no more than .	-	-	-	-	-	330;	400	330; 400
Upper limit, no less than .	-	-	-	-	-	800;	830	800; 830
Lowering of actuating member below seam rock (no less than), mm	-	-	-	900	900	900	900	900
Grab width, mm.	0.76	0.9; 1.5	1.41;	1.41;	1.29;	1.23;	1.23;	1.79;
Cutting rate, m/s					2.04	1.75	1.75	2.16
Type of cutting tool	ZN2	180B	190	190MB;	190MB;	190MB;	190MB;	190MB;
				RKS1	RKS1	RKS1	RKS1	RKS1
Feed mechanism, type.	1LGKN	1LGKN	1LGKN	1LGKN-M	1LGKN-M	1LGKN-M	1LGKN-M	1LGKN-M
Feed rate regulation range, m/min:								
Working	0.43-1.8	0.43-1.8	0.76-1.95	0.76-1.95	0.76-1.95	0.76-1.95	0.76-1.95	0.76-1.95
Maneuver.	5.88	5.88	5.9	5.9	5.9	5.9	5.9	5.9
Maximum tractive force of feed mechanism, kN.	100	100	100	100	100	115	115	115
Extraction machine drive, type.	K2F	K10F-25	K10F-25	EKF2.5-30	K18F-25	EKF2.5-30	EKF2.5-30	EKF2.5-30
Extraction machine drive power, kW:								
Pneumatic, with compressed pressure $\leq 0.4$ MPa	14	14	18.5	18.5	-	-	18.5x2	-
Electric.	-	-	-	-	-	30	-	30x2
Basic dimensions, mm:								
Length.	3,190	3,950	4,060	3,075	3,075	4,286	4,286	4,286
Rigid base, by length	1,400	1,510	1,650	1,800	1,800	2,140	2,140	2,140
Width	1,110	1,240	1,240	1,200	1,200	1,230	1,230	1,230
Housing height from bed	254	255	280	285	285	285	285	285
Extraction machine weight, kg	2,720	2,863	2,750	2,500	2,340	3,770	3,770	3,900

At the Pervomayskugol Association's Zolotoye Mine, a series-produced Poisk-2 combine with an EKV 2.5-30 electric drive is working an Almaz bed 0.6-0.8 m thick. Coal extraction in January 1985 was 7,885 t. The basic factor retarding higher productivity with the combines is a frequent lack of empty cars and losses of time for transferring and setting up the enameled chutes. The coal does not move by gravity flow, because the seam's angle of incidence is only 35-38° and the coal's resistance to cutting is up to 28 N/cm. Since February 1985 another Poisk-2 combine has been mastered at Dzerzhinskugol's Yuzhnaya Mine. Considering the complex geological mining conditions, the plan was set at 123 t per day, and is being overfulfilled. Daily productivity is 185 t. Previously this seam could not be worked with combines. From the fourth quarter of 1985, when the production of EKV 2.5-30 electric motors is planned, the Poisk-2 will be series produced as the basic version. The parameters and basic dimensions of the combines for working extremely thin, steeply sloping seams that have been described are presented in the table.

During the development of "Techniques for Evaluating the Technical Level of Combines for Steeply Sloping Seams," the Poisk-2's parameters were taken as the majority of the basic indicators for seams 0.3-0.85 m thick. The results of the operation of a Poisk-2 combine, fitted with two EKV 2.5-30-U5 electric motors with a total power of 60 kW, on an Almaz seam at the Zolotoye Mine (Pervomayskugol), where a maximum daily production of 465 t has been achieved, confirm the promise of the use of combines under different geological mining conditions when their power resources are fully utilized.

Under different geological mining conditions, when the extraction section's work is organized correctly, the compressed air pressure at the longwall is at least 0.3 MPa, and the pneumatic air line's productivity is 40-50 m<sup>3</sup>/min, a Poisk-2 combine with pneumatic drive can insure the daily extraction of at least 200-450 t of coal from a seam 0.35-0.85 m thick.

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CSO: 1822/359

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UDC 553.95+553.96(477):622.33

ROLE OF DONBASS, OTHER REGIONS IN SUPPLY OF COAL TO UKRAINE

Kiev UGOL UKRAINY in Russian No 7, Jul 85 (signed to press 27 Jun 85) pp 23-24

[Article by S.D. Pozhidayev, candidate of geological and mineralogical sciences, and N.P. Tkachenko and P.G. Boyko, engineers, Dnepropetrovsk Branch, IMR [Institute of Mineral Resources]: "On the Possibility of Curtailing the Delivery of Power-Producing Coals to the Ukraine"]

[Text] The extended and intensive exploitation of the Donbass has led to significant depletion of the coal reserves in the productive strata and complication of the technical mining conditions. For a number of years the Ukraine has not only exported coal, but has also received it from other basins. In connection with this there have arisen opinions that the Donbass's value in supplying the needs of the southern and central sections of the European part of the country for coal will decline steadily in the future. In order to substantiate or refute this prediction it is necessary to conduct integrated investigations of the potential possibilities of the country's main coal basins, the prospects for a change in the national economy's coal requirements, the development of the transportation system, social questions, environmental preservation and so on.

However, a comparison exports and imports of power-producing coals in the UkSSR shows that the Donbass's possibilities are still quite great. In the 10th Five-Year Plan about 20 percent of the extracted coal was exported from the Ukraine; exports were reduced by 7 million t in 1982 in comparison with 1975 (including 2 million t of power-producing coals). About 12 percent of the coal consumed in the republic was imported. In the 1975-1982 period the importation of coal increased by 9 million t, including 3 million t of the power-producing varieties.

In the UkSSR fuel is delivered to 41 electric power plants that are combined into 8 power systems. However, the grade composition of the coal consumed by electric power plants is divided into two groups: coals of grade D and grades G, A and T.

In connection with the deficit of power-producing coals and the deterioration in the structure of the coals and the products obtained by treating them, as delivered to the electric power plants, in recent years there has been a sharp increase in the importation of power-producing coals from the other basins in

Area	Coal Imports by Years, Millions of Tons							
	1975	1976	1977	1978	1979	1980	1981	1982
<b>Coal basins:</b>								
Kuznetsk . . . . .	0.64	1.36	0.81	2.60	2.70	3.24	1.90	1.15
Karaganda . . . . .	1.70	1.90	0.12	0.32	0.61	0.45	0.98	1.16
Pechora . . . . .	0.90	0.75	1.03	0.84	0.72	0.63	-	1.70
Donetsk (RSFSR) . . . . .	2.74	3.87	3.04	2.45	2.57	2.69	3.05	1.93
Silesian (Poland) . . . . .	-	-	-	0.08	-	0.36	-	3.21
Georgian SSR. . . . .	-	-	-	-	0.24	0.09	1.00	-
RSFSR Mesttop [translation unknown]. . . . .	-	-	0.05	-	0.77	0.69	0.64	-
Total . . . . .	5.98	7.88	5.05	6.29	7.31	8.15	7.57	9.15

the country. From 1975 to 1982, coal was delivered from the Kuznetsk, Pechora (intinskiye [translation unknown] coals and intermediate products from USSR Minchermet's (Ministry of Ferrous Metallurgy) Cherepovets Coke and Chemical Plant), Karaganda and other basins.

From the table it is obvious that the share of Kuznetsk coals increased irregularly until 1980 and then dropped slightly. The Pechora and Georgian coals were imported on about the same level and the delivery of coals from the Western Donbass decreased. In 1982 about 35 percent of the coals were shipped from the Silesian basin (PNR [Polish People's Republic]), 21 percent from the Eastern Donbass, 18 percent from Pechora, 13 percent from Karaganda, 12 percent from Kuznetsk and 1 percent from the Georgian SSR.

By grades and classes, the coals delivered for power-producing purposes were distributed in the following manner: anthracites (ASh, AS, AM, AR) and their intermediate products, 11-22 percent; cannel coals (DR) and their intermediate products, 15-18 percent; Karaganda gas coals (KGR<sub>2</sub>) and their intermediate products, 14-28 percent; Pechora coals (DR + GR + TR) and their intermediate products, 11-46 percent; gas coals (GR) from the Silesian basin, 4-35 percent.

The most valuable power-producing fuel is the Kuznetsk coals. As far as heat value is concerned, they surpass the power-producing coals from the Donetsk, Karaganda and Pechora basins and are also low in ash. The average ash content of the coals shipped to consumers from the Kuznetsk basin is 11.8 percent; from Donetsk--15.4 percent; Karaganda--23.4 percent; Pechora--20.1 percent. Kuznetsk coals also distinguish themselves favorably as far as sulfur content is concerned: 0.6 percent. Pechora coals' sulfur content is 3 percent. The high heat value and relatively good mechanical strength make it possible to burn Kuzbass coal in fire chambers of various types.

An analysis of expenditures for several years indicates the inadvisability of long-distance shipments of power-producing coals to the Ukraine. The cost per ton of Kuznetsk coals stayed the same in the 1975-1982 period (17.33-17.36 R), and the cost of transporting them was 10.28-10.81 R. For Karaganda coals in 1975, the respective figures were 13.87-15.58 R and 8.2-8.46 R; for Pechora coals they were 13.5-16.22 R and 6.5-9.37 R.

The fluctuations in the cost of imported coals depended on the quality of the fuel. For comparison, let us examine the expenditures for obtaining it and transporting it from the Donbass. In 1975 the cost of obtaining 1 t of coal was 12.74 R, whereas in 1982 it was 10.71 R, and the transportation cost was 1.33 and 1.43 R, respectively. If one takes into consideration the load on railway transport and cross hauls, the economic inadvisability of importing power-producing coals into the Ukraine will be obvious.

In the republic there exists an already-prepared raw material base--more than 100 sections in which new mines can be set up. The selection of sections for construction and modernization of mines can be enlarged through the use of "salty" coal deposits (Bogdanovskoye in the Northern Donbass and Novomoskovskoye in the Western Donbass). The extraction of power-producing coals can be increased as the result of the development of beds in the regions already being exploited that are substandard as far as thickness and ash content are concerned.

The deficit of solid power-producing fuel can also be compensated for by building an open pit mine with an annual capacity of 9 million t at the Novodmitrievskoye brown coal deposit and exploiting the relatively shallow-lying power-producing coals in the Western Donbass, particularly in Lozovskiy Rayon and the northern part of Krasnoarmeyskiy Rayon. Thus, the UkrSSR is capable of supplying its own needs for solid power-producing fuel for a long time.

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CSO: 1822/359

COAL

SYNOPSIS OF ARTICLES FROM UGOL UKRAINY, JULY 1985

Kiev UGOL UKRAINY in Russian No 7, Jul 85 (signed to press 27 Jun 85) pp 47-48

UDC 622.232.72:622.26:65.011.56

NEW FRONTIERS IN AUTOMATED FACE EQUIPMENT

[Synopsis of article by V.A. Antipov, pp 2-4]

[Text] The Avtomatgormash [expansion unknown] NPO [Scientific Production Association] has developed and is mastering the use of automated complexes and combines, as well as systems for the automation of this equipment in accordance with the "Energokompleks" program. 3 illustrations.

UDC 622.234:621.318.562.7

STANDARDIZED, SPARK-SAFE ELECTRONIC TIME RELAY

[Synopsis of article by I.I. Shtern, A.F. Maletkin and B.Ya. Azrilyan, pp 4-5]

[Text] Basic electrical circuits and operating algorithms of a standardized electronic time relay. 3 illustrations.

UDC 622.237.72"77":622.031.22-118(477.61/.62)

MECHANIZATION OF COAL EXTRACTION IN EXTREMELY THIN, STEEPLY SLOPING SEAMS IN THE DONBASS

[Synopsis of article by V.G. Goryachiy and B.A. Kodenko, pp 6-8]

[Text] Creation of the Malysh and Poisk stoping machines, the perfection of their basic parameters and their area of utilization. A brief analysis of the effectiveness of the utilization of the combines and the prospects for their further use under the conditions present in the central region of the Donbass. 3 illustrations, 1 table.

UDC 622.232.65.012.1

M.M. YANOVSKIY'S CREW ON THE LABOR WATCH

[Synopsis of article by N.S. Yarylchenko and M.G. Levertov, pp 9-11]

[Text] Work experience of the GROZ [expansion unknown] crew led by M.M. Yanovskiy, at the Rovenkiantratsit Association's Mine imeni Kosmonavty. Organization of their work. Technical and economic indicators. Commitments. 2 illustrations.

UDC 622.261:622.232.003.13

#### SELECTING THE METHOD FOR DIGGING PREPARATORY WORKINGS FOR EXTRACTION FROM UPWALLS

[Synopsis of article by V.P. Sokhatskiy and R.K. Khansivarov, pp 11-12]

[Text] Variants for digging workings from the viewpoint of selecting the method for blasting the surrounding rock and the stability of the roof at longwall junctions. The effect of the cutting method on the effectiveness of working face operations. Recommendations for improving the state of workings at junctions with longwalls. 2 illustrations, 1 reference.

UDC 622.831.322

#### UNCOVERING SEAMS, USING SYSTEMS FOR THE LOCALIZATION OF SUDDEN BLOWOUTS

[Synopsis of article by V.P. Kuznetsov, P.K. Belyakov and I.A. Novychikhin, pp 13-15]

[Text] Fundamental propositions on the localization of blowouts when uncovering blowout-prone seams by the installation of obstructing systems. Results of experimental work on the use of the blowout localization method in mines in the Donbass. 2 illustrations, 1 reference.

UDC 622.831.232

#### EFFECT OF BLASTING ON ROCK HEAVING IN PREPARATORY WORKINGS

[Text of article by V.P. Zubov, L.N. Chernyshkov and K.N. Lazchenko, pp 15-16]

[Text] Results of mine investigations of the effect of rock blasting on the intensity and nature of rock displacements in preparatory workings. Dependence of the amount of rock blasting work on the service life of a working, the depth at which it is located and the physicomechanical properties of the rock. 2 illustrations, 2 references.

UDC 622.268.13:622.831.24

#### ON THE EFFECTIVENESS OF THE CONTROL OF A ROCK MASS

[Synopsis of article by I.F. Potapkin and I.I. Potapkin, pp 17-18]

[Text] Utilization of a radio-wave method, developed at DPI [Don Polytechnic Institute], to monitor the status of a rock mass when selecting the optimum

parameters for securing the rock around a working. Mechanism of the formation of the zone of loosened rock during the cutting of a haulage cross-cut at the Donetskugol Association's Yuzhnodonbasskaya No 3 mine. Conclusions. 3 illustrations.

UDC 622.25:622.235.11

EFFECT OF THE ARRANGEMENT OF THE BLAST HOLES IN THE FACE OF A VERTICAL SHAFT ON THE QUALITY OF ROCK DEMOLITION

[Synopsis of article by A.S. Polyakov, pp 18-19]

[Text] The author proposes a system for the placement of blast holes in the face of a vertical shaft that insures better rock crushing when the charges are detonated and an increase in the depth of the blasted hole. 1 illustration, 1 reference.

UDC 622.271:624.131.43

EFFECT OF MINE GEOLOGICAL FACTORS ON THE CONDITIONS FOR WORKING THE VERKHNEPROVSKOYE DEPOSIT

[Synopsis of article by L.P. Zagoruyko, N.S. Koshevoy, V.T. Vovk and S.V. Olevskaya, pp 19-21]

[Text] Geological, hydrogeological and geological engineering conditions in the Verkhnedneprovskoye brown coal deposit. Recommendations for insuring the stability of side slopes and terraces, on the passability of mining transport machines and the drainage of the open pit field, and on the selection of types of machines and the levels for their placement. 1 table.

UDC 622.33.012.2:69.05:658.012.2

ECONOMIC CALCULATIONS FOR THE WORK PLANS FOR CREWS, SECTIONS AND ADMINISTRATIONS OF USSR MINUGLEPROM'S CONTRACTING ORGANIZATIONS

[Synopsis of article by V.B. Sivyy and V.S. Gusak, pp 22-23]

[Text] Basic propositions of the technique for lower-level planning of the autonomous financing activities of USSR Minugleprom's [Ministry of the Coal Industry] construction organizations. 1 table, 1 reference.

UDC 553.93+553.96(477):622.33

ON THE POSSIBILITY OF CURTAILING THE DELIVERY OF POWER-PRODUCING COALS TO THE UKRAINE

[Synopsis of article by S.D. Pozhidayev, N.P. Tkachenko and P.G. Boyko, pp 23-24]

[Text] Analysis of the status and prospects for the development of a raw material base of power-producing coals. Possibility of curtailing their delivery to the Ukraine. 1 table.

UDC 622.013:338.5(083.57)

**ANALYSIS AND PREDICTION OF COAL PRODUCTION COST WITH THE HELP OF NOMOGRAMS**

[Synopsis of article by I.A. Furletov, G.G. Furletova and V.V. Zhilkin, pp 24-25]

[Text] The use of nomograms to analyze and predict the functions of multi-factor processes, including coal production cost at the Vorkutaugol Association's mines. 1 illustration.

UDC 622.268.7:622.23

**EFFECT OF TECHNICAL MINING FACTORS ON THE LABOR-INTENSIVENESS OF FINAL OPERATIONS AT COMPLEXLY MECHANIZED FACES**

[Synopsis of article by V.T. Volkov, A.M. Plotnikov and S.I. Grishkov, pp 26-28]

[Text] The discrimination at junctions of longwalls with adjoining workings of functionally and regionally interrelated zones. The labor-intensiveness of final operations in the zones and ways of reducing it. 2 illustrations, 1 table, 1 reference.

UDC 621.316.57.027.2-213.34:622.011

**AUTOMATIC, EXPLOSIONPROOF MINE SWITCHES**

[Synopsis of article by Ya.S. Riman, F.I. Kukenko and I.I. Ivashchik, pp 28-29]

[Text] The purpose, layout and operating principle of the new AV-400DO and AV-400DO2 automatic, explosionproof mine switches with remote disconnection. They operate on 660 and 1,140 V and have high levels of antiexplosion protection. 1 illustration, 1 table.

UDC 622.23:620.179.14.05:669.14-427.4

**DEFECTOSCOPE FOR DETERMINING LOSS OF CROSS-SECTION OF CABLES MADE OF ZINC-PLATED WIRE**

[Synopsis of article by N.S. Muzychenko, S.S. Klimenko and M.A. Golovatyy, pp 29-30]

[Text] Experience in using steel mine cables made of light wire. Instrument monitoring of cables with IISK-5 measurers. 2 illustrations.

UDC 622.53:622.284.54

**RESULTS OF INDUSTRIAL TESTS OF SNT-32 PUMPING STATIONS**

[Synopsis of article by Yu.I. Varshavskiy, Ya.D. Reka and Ye.A. Mufel, pp 30-31]

[Text] Technical data on the SNT-32 pumping station, its reliability and durability, efficiency of the original control system that was adopted. 1 illustration.

UDC 622.285 "M-87UM":622.232.8 "KM-87UMN", "KM-87UMP", "KM-87DN"

#### DEVICE FOR IMPROVING THE STABILITY OF M-87UM MECHANIZED TIMBERING

[Synopsis of article by D.I. Gots, V.A. Kotov and A.N. Bondaletov, pp 31-32]

[Text] Design decisions for improving the lateral stability of timbering in the KM-87DN, KM-87UMN and KM-87UMP complexes and positive experience in tests of the device under complex geological mine conditions. 1 illustration.

UDC 622.647.2

#### THE LLT-100 TELESCOPIC BELT CONVEYOR

[Synopsis of article by A.N. Vychigin, O.A. Savelyev and V.N. Starik, pp 33-34]

[Text] Layout and operating principles of the LLT-100 telescopic belt conveyor. 2 illustrations.

UDC 622.625.51(045)

#### CONTAINER-TYPE UK UNIT AT HYDRAULIC MINES

[Synopsis of article by N.N. Krupin, A.F. Dubich and M.I. Papkov, pp 34-35]

[Text] Technical data, layout and operating principle of a container-type UK [expansion unknown] unit. Results of official tests of experimental models at the Krasnoarmeyskaya and Pioneer hydraulic mines. 2 illustrations.

UDC 622.648.2:622.234.42.001.5

#### ON THE PARAMETERS OF THE HYDRAULIC TRANSPORTATION OF COAL WITH A HIGH CONTENT OF ALKALINE METALS

[Synopsis of article by Yu.F. Vlasov and A.A. Krut, pp 35-36]

[Text] Investigation of the hydraulic transportation of coals with a high content of alkaline metals. Refinement of the relationship for calculating the basic parameters of hydraulic transport. 2 tables, 2 references.

UDC 622.233.4.53:621.892.09

#### START-UP OPERATING MODE FOR A SCREW-TYPE MINE COMPRESSOR STATION

[Synopsis of article by V.V. Loboda, pp 36-37]

[Text] Results of experimental investigations of the start-up operating modes of a ZIF--ShV-5 screw-type mine compressor station. Ways for improving its efficiency. 2 illustrations, 1 reference.

UDC 621.316.71:622.67

#### DYNAMIC BRAKING SYSTEM FOR CAGE HOISTS

[Synopsis of article by I.Ya. Galperin, S.G. Martynovskiy and A.S. Ivashchenko, pp 37-38]

[Text] Layout and operating principle of a dynamic braking assembly for cage-type hoisting installations. 2 illustrations.

UDC 622.678+621.899

#### EQUIPMENT COMPLEX FOR CLEANING THE OIL IN UNDERGROUND HOISTING UNITS

[Synopsis of article by I.Yu. Gutman and V.S. Semenov, p 39]

[Text] Design and effectiveness of utilization of a complex for cleaning the oil in mine underground hoisting units; operating principle. 1 illustration.

UDC 622.418:622.413.3

#### HEAT CONDITIONS FOR LABOR IN A MINE AND CRITERIA FOR THEIR QUANTITATIVE EVALUATION

[Synopsis of article by B.A. Gryadushchiy and A.M. Krivoruchko, pp 40-41]

[Text] Indicators that make it possible to evaluate objectively the status of the heat conditions for labor in the working zone, a section, a mine and an association. 1 reference.

UDC 621.39:622.81.001.2

#### SPARK-SHIELDING DEVICE FOR BATTERY-POWERED MINE LAMPS

[Synopsis of article by V.F. Senko and B.A. Kuznetsov, p 42]

[Text] Spark-shielding device for battery-powered miner's head lamp that performs the function of protecting the electrical circuit against sparking and preventing deep discharging of the storage battery. Operating principle and parameters of the spark-shielding system. 1 illustration, 2 references.

UDC 622.822.24:536.5

#### INVESTIGATION OF THE TEMPERATURE FIELD DYNAMICS IN A WORKING DURING THE DEVELOPMENT OF A FIRE

[Synopsis of article by V.A. Dolinskiy, S.A. Alekseyenko and I.N. Zinchenko, p 43]

[Text] Relationship for determining the temperature of the fire gasses at different distances from the combustion zone at any time from the beginning of the development of a fire. 1 illustration, 2 references.

UDC 556.33+622.333(477.63)

#### TECHNIQUE FOR EVALUATING FLOWS OF WATER INTO MINES IN THE WESTERN DONBASS

[Synopsis of article by A.M. Antropsev and T.D. Kudryavets, pp 44-45]

[Text] Technique for evaluating water flows into mines in the Western Donbass that is based on an analysis of the hydrogeological conditions and the processing of observational data. Standard beds (bed analogs), for which graphs have been constructed, that reflect the average values of actual influxes. Formulas for predicting influxes of water. 2 illustrations, 2 tables.

UDC 622.51:628.33/.35+622.531.004.1

#### OPERATION OF A NEW SIX-SECTION PRESSURE FILTER AT THE KOMSOMOLSKAYA MINE

[Synopsis of article by Ye.V. Grigoryuk, L.M. Vitrenko, S.F. Sergiyenko and A.V. Milyutin, p 45]

[Text] A new six-section pressure filter at the Antratsit Association's Komsomolskaya Mine, the system by which it is connected to the mine water distribution lines, the results of utilization of the filter. 1 illustration, 1 reference.

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CSO: 1822/359

NUCLEAR POWER

STATUS OF DIRECTED THERMONUCLEAR FUSION, TOKAMAK EXPERIMENTS

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 9, Sep 85 pp 26-28

[Article by Yuriy Krakhmalev, CEMA Secretariat: "Thermonuclear Fusion--Power Engineering of the Future"]

[Text] The modern world lives in a time of continual growth of energy consumption. In the last few decades energy production on earth increased ever-faster, doubling every 15 years; in this case more than 90 percent of this energy is provided by nonrenewable fossil fuels--coal, oil and gas. The reserves of such fuel are being depleted so quickly that a shortage will be felt in the mid-21st century, and mankind will experience a shortage of oil per se by as early as the end of the current century. This factor, as well as the detrimental influence of combustion upon the environment, compel mankind to seek new sources of energy.

It is now universally recognized that the energy needs of society could be satisfied in the future only by improving nuclear technology, primarily based on the nuclear reactions involved with fission of heavy elements at nuclear power plants. For the moment mankind has no other alternative. Presently the total output of nuclear power plants represents 8 percent of the world's energy economy, and these power plants produce about 12 percent of all electric power.

As we know, mankind has also opened up another possibility for utilizing nuclear energy--the nuclear reactions of fusion of light elements, which has come to be called controlled thermonuclear fusion. Scientific research in this area has been going on for a long time not only in the USSR but also in other countries. In the USSR's long-term energy program, thermonuclear power engineering is viewed as one of the most probable directions of the efforts to create a practically inexhaustible energy source. Power engineering based on fusion reactions, if it achieves successful practical realization, can become a significant supplement to power engineering based on fission reactions. A confirmation of this can be found in the accomplishments of research on controlled thermonuclear fusion, especially in recent years.

Analysis of the present level of research on controlled thermonuclear fusion, in which the Soviet Union continues to occupy the leading position, permits

the conclusion that the fundamental issues in this area have either been resolved, or their resolution is in its final stages. The preconditions for a transition from laboratory experimentation to design of thermonuclear reactors have been created.

The main advantage of thermonuclear power engineering is the presence of large and relatively cheap raw material resources. The nuclear reaction of fusion of hydrogen isotopes--deuterium and tritium--is closest to practical implementation. This reaction requires a temperature of about 100 million degrees (which is why these reactions are called thermonuclear). The reserves of deuterium, contained in the waters of the oceans, are practically inexhaustible. Energy which may be obtained from deuterium contained in a liter of ordinary water is equivalent to about 300 liters of gasoline. Thus the problem of nonuniform distribution of energy sources over the globe is easily solved.

The principal merits of controlled thermonuclear fusion include: nuclear safety of thermonuclear reactors, which permits their location near cities and densely populated places; absence of major mining and of the danger of chemical pollution of the environment; significantly fewer radioactive wastes (in comparison with fission reactors). An intensive source of neutrons, the thermonuclear reactor is a unique system for obtaining and transforming elements and obtaining synthetic fuel. It can also effectively support the high-temperature cycles of energy conversion and high-temperature metallurgical processes.

In the power engineering of the future, together with fast neutron breeder reactors, thermonuclear fusion should become an important means of production of not only electrical energy but also artificial nuclear fuel for thermal neutron power plants. Soviet scientists made a significant contribution in this respect, having proposed the concrete conception of the so-called hybrid thermonuclear reactor which, in addition to producing electrical energy, will be used to produce nuclear fuel (plutonium). Considering production of additional nuclear fuel, the hybrid thermonuclear reactor is economically advantageous, and this means that it can become a significant element in power engineering in the relatively near future. Thus it would become noticeably easier to solve the problem of supplying nuclear fuel for nuclear power engineering. Work on such a reactor, which was named an experimental thermonuclear reactor in the USSR, has begun. Some other CEMA countries have joined this effort as well.

Mention must be made of the difficulties that arise in the course of creating a thermonuclear reactor, and particularly its technological complexity. The main reason delaying active development is the absence of a demonstration experiment run with the purpose of demonstrating conversion of the potential of controlled thermonuclear fusion into a practical reality. This has become the principal issue in the present stage of research.

Were we to determine the largest stages of scientific research and development concerned with controlled thermonuclear fusion all the way up to the final goal--creating a thermonuclear electric power plant, we could name four

today: physical research, scientific demonstration (the demonstration experiment), creation of an experimental thermonuclear reactor, and creation of a thermonuclear electric power plant with acceptable technical-economic indicators.

Experts feel that in the case of successful completion of all stages, practical use of energy from controlled thermonuclear fusion may begin at the beginning of the next century. Today the problem entails preparing the experimental base for the stage of scientific demonstration.

The main task of the present stage of work on controlled thermonuclear fusion is to create conditions in which an energetically advantageous thermonuclear fusion reaction could proceed. In principle, these conditions may be achieved in systems in which the plasma is confined magnetically or, more accurately, in one particular such system--the so-called TOKAMAK system. The idea behind the TOKAMAK was first suggested and then practically implemented in the USSR by a collective of scientists of the Institute of Atomic Energy imeni I. V. Kurchatov. In terms of their principle of action, TOKAMAK devices are compared with an electrical transformer in which the secondary winding is replaced by a toroidal evacuated chamber. When current is passed through the primary winding of the transformer to its secondary winding--the evacuated chamber, an electric gas breakdown occurs, and a closed plasma loop forms. Current flowing through the loop heats the plasma; a strong longitudinal magnetic field directed along the flow of the current is used to thermally isolate the plasma from the chamber walls.

The TOKAMAK conception underwent development for a long time only in the USSR, but following a successful experiment with the TOKAMAK-3 in 1968, in which the plasma temperature attained 10 million degrees, devices of this sort attained wide acceptance throughout the entire world and achieved a leading position.

The USA, Japan and West European countries reoriented their national thermonuclear programs on use of the TOKAMAK system. New large TOKAMAKs of the pre-reactor generation are being erected--the TOKAMAK-15 (USSR) and the DZhT-60 (Japan); in 1983 the TFTR thermonuclear device went into operation in the USA; owing to the efforts of Euratom countries, a DZhET class device also began operating in England. It is most probable that devices of precisely this type will be used for the first time for the scientific demonstration mentioned above. All preceding research indicates that this will be done in the next 3-5 years.

The Soviet Union has always favored the widest international cooperation on the controlled thermonuclear fusion problem. In 1978 our country proposed, to the International Agency for Atomic Energy (MAGATE), uniting the efforts of states conducting active research to create the first demonstration thermonuclear reactor. This proposal was actively supported.

Today an international collective of scientists from the USSR, USA, Japan and Europe has completed, under the sponsorship of the MAGATE, development of the conceptual plan of a TOKAMAK thermonuclear reactor, which was named

the INTOR. And although the decision for its erection is still under discussion, the importance of the work done thus far is undisputable: Creation of a thermonuclear reactor on the basis of a TOKAMAK with regard for modern technical accomplishments is transforming from an abstract idea to reality.

Besides participating in the INTOR project, the Soviet Union is concurrently conducting an extensive program of research and engineering with the purpose of creating the scientific-technical base of thermonuclear power engineering. For the moment this effort is being concentrated chiefly on the TOKAMAK-10 and TOKAMAK-7 devices. These are to be superseded by the TOKAMAK-15, which will become the basis of research in the 1980s. A number of scientific collectives, both Soviet and from fraternal countries, are participating in the planning and, later on, implementation of the program.

In 1978 the 34th session of the CEMA Permanent Commission for Cooperation in Peaceful Use of Nuclear Energy adopted TOKAMAK thermonuclear devices with magnetic plasma confinement as the basis for cooperation among CEMA countries in controlled thermonuclear synthesis, owing to the great advantages such devices have over other directions of research. During drafting of the details of the agreements for cooperation, a decision was made to carry on this cooperation in the following aspects: scientific research using existing TOKAMAK devices; development, manufacture, delivery and adjustment of individual units and systems of the TOKAMAK-15 (T-15) complex; development of future plans of TOKAMAK thermonuclear reactors.

In 1979 the commission approved a program for cooperation among CEMA countries in controlled thermonuclear fusion in 1980-1990, and it adopted a decision to draft bilateral agreements between the CEMA countries and the USSR for fulfillment of this program. By 1982 five bilateral agreements were already in effect, signed by the USSR State Committee for Utilization of Atomic Energy and the corresponding departments of Bulgaria, Hungary, the GDR, Romania and Czechoslovakia.

The concrete volume, stages and forms of completion and distribution of work among the organizations of the agreeing parties are determined by the work plans, which are an inseparable part of the agreement. These plans can be updated and supplemented upon mutual consent of the parties. It should be noted that from the very beginning the process of organizing and effecting cooperation among CEMA countries in controlled thermonuclear fusion bore a friendly, creative and informal nature. Many joint projects were started long before agreements were signed--for example with Hungary, the GDR and Czechoslovakia.

In its 42d session in 1982, the commission summarized the first results of this cooperation. These results had to do with joint scientific research with existing TOKAMAK devices. It was noted in the commission's resolution that in the next few years, preparations for scientific research and engineering work on the experimental TOKAMAK-15 thermonuclear device must be the most important direction of cooperation.

It can be said today that the joint work to create the T-15 device done by Soviet scientists and scientists from CEMA countries deserves the highest evaluation from the standpoint of both the independent scientific significance of this work and the prospects for utilizing its results to erect an experimental thermonuclear reactor.

The total cost of the device is estimated at about 120 million rubles, and about 100 Soviet enterprises will take part in manufacturing its equipment. Construction in the experimental building has now been completed, and installation of the equipment of the device itself has begun. The deadlines determined earlier are being postponed somewhat. This is explained by difficulties encountered by industry in developing and manufacturing the unique equipment, by the absence of analogues, and by the need for developing entirely new technology. A large number of process engineering problems must be solved; without this, it would be impossible to go on to the next stage of the work--creation of the experimental thermonuclear reactor. The chief problem is creation of the device's superconducting electromagnetic system.

Erection of the T-15 has entered its concluding phase. Maximum concentration of efforts to create the device and accomplish a transition to the next stage--the conduct of scientific research with an operating device--is required today of all CEMA countries. This is the main task.

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## NUCLEAR POWER

## BRIEFS

GIANT TURBOGENERATORS OF TOMORROW--Leningrad, [Oct] 9--Specialists of the Elektrosila Association's scientific research institute have begun drafting plans for a 1.5 million kilowatt turbogenerator for nuclear power plants. What sort of machines are to be provided to nuclear power plants in the 1990s? This is what scientists and designers of Elektrosila are thinking about right now. Initial development of the million and a half kilowatt machine will make it possible to determine the dimensions of the giant's moving parts beforehand and furnish the technical requirements to the metallurgists and to specialists of the metalworking operation. [By correspondent V. Senin] [Text] [Moscow PRAVDA in Russian 10 Oct 85 p 1] 11004

NEW REACTOR AT KURSK--Physical start-up of the reactor of the fourth power production unit of the Kurskaya Nuclear Power Plant, which has an output of one million kilowatts, has been achieved. "Full-scale loading of the machine unit's fuel assemblies has begun," said the plant's deputy director for science T. Nikolayev. "We have reached the most important stage of the unit's preparation--release of electrical energy into industrial power supply networks." After the new machine unit is introduced into the country's unified power system, the Kurskaya Nuclear Power Plant will supply over 25 billion kilowatt-hours of inexpensive electrical energy each year. Since the power plant went into operation, its counters have already recorded over 111 billion kilowatt-hours. [By correspondent V. Kulagin] [Text] [Moscow IZVESTIYA in Russian 1 Nov 85 p 1] 11004

REMOTE POSITION INDICATOR--Development of a remote indicator for nuclear power plants was completed in the special flowmeter design and technological bureau of the Tallinn Prompribor Production Association. An interdepartmental acceptance commission that tested the experimental models of the instruments gave them a high assessment and recommended them for series production, followed by their subsequent certification in the top quality category. The importance and great national economic impact of this development stem from the fact that the instrument is a necessary element of a power plant's safety system, reducing the probability of radiation injury to personnel and discharge of radioactive substances into the environment under all reactor operating conditions. Without this instrument, a plant cannot be accepted for operation. Until the present, remote position indicators that could work within the thermal zone of a nuclear power plant had not been produced by USSR and CEMA industry; instead, they were acquired from

capitalist countries. Series production of Soviet remote indicators by the Tallinn Prompribor Production Association is to begin as early as at the end of the current year. [By I. Shpinev] [Text] [Tallinn SOVETSKAYA ESTONIYA in Russian 13 Oct 85 p 3] 11004

CSO: 1822/88

NON-NUCLEAR POWER

POWER MINISTRY RESPONDS TO PUMPED STORAGE LOCATION PROPOSAL

Moscow EKONOMICHESKAYA GAZETA in Russian No 40, Oct 85 p 11

[Article by V. Veselov under the rubric "Following up our Articles": "A Power Station in a Quarry"]

A weekly publication has printed an article entitled "A Power Plant in a Quarry" in issue No. 32 by V. Markov, senior fellow in science at the Commission for the Study of Productive Forces and Natural Resources attached to the presidium of the USSR Academy of Sciences. The article proposes setting up pumped storage power plants in deep abandoned quarries.

The development of switching capacity is a critically necessary contemporary task, but quite expensive to put in place. Any proposal to reduce the cost of constructing pumped storage power plants thus deserves careful consideration.

On instructions from A. Mayorets, USSR minister of power and electrification, the article was reviewed by the Main Administration for Planning and Scientific Research Efforts. L. Voronin, administration director, told the editors that in principle, the solution proposed by the author merits consideration. Gidroproyekt Institute was given the assignment to review the matter thoroughly from all angles in the 12th Five-Year Plan, consulting with other ministries and departments as necessary.

Clearly, this is the proper procedure. The only disturbing part is that there is no indication whatever of a specific start-up date. A five-year plan is a long time. If Gidroproyekt gets started right away, that's one thing, but if the Institute starts toward the end of the plan, that is another matter. This important matter needs to be clarified by Institute supervisors. All the more so, since deep-quarry workers themselves are already offering to help. For instance, Head Engineer V. Vasilyev of the Korkinskiy Open Pit in Chelyabinskaya Oblast writes to say that his workers have tentative ideas about how to accomplish some preliminary work to set up a pumped storage power plant while the quarry is still in operation. It would be advisable for scientists and practical workers to join efforts without delay.

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CSO: 1822/72

NON-NUCLEAR POWER

BLACKOUTS, GAES IN BELGOROD

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Sep 85 p 1

[Article by Yu. Antropov, SOTSIALISTICHESKAYA INDUSTRIYA's special correspondent in Belgorodskaya Oblast, under the "Rural Industry" rubric: "A Trial for Power Personnel"]

[Excerpts] I remind the readers of SOTSIALISTICHESKAYA INDUSTRIYA that due to a heavy storm, several areas in Belgorodskaya Oblast were without electricity on 9-10 January of this year. Not only the wires, but also the support towers, especially reinforced concrete towers, were unable to withstand the enormous weight of the ice. Hundreds of kilometers of 10- and 35-kV rural transmission lines were totally destroyed.

Everyone knows that a chain snaps at its weakest link. The past months, especially the summer, were an extremely busy time for the linemen: they had to replace twice and three times as much temporary line with permanent line as was called for in the plan. By the beginning of August, 650 km of 10,000-kV line had already been replaced. The smaller remaining segments are slated for replacement in September, before cold weather. Five hundred km of lines that did not fall, but were damaged to some extent by the ice storm, were also repaired. Approximately 200 more transformer substations than planned were installed. One might ask whether quantity has been achieved at the expense of quality. After all, this does not guarantee that another ice storm won't cause the same problems. Have we not learned our lesson?

"We have learned our lesson to a considerable extent," Belgorodenergo Assistant Manager A. Bragin and Selkhozenergo Manager A. Popov firmly answered me. "The fact is that we are not just patching things up and restoring service; we are trying to ensure far more reliable power supply for rural workers."

But the power authorities' concerns for rural needs do not end here. As everyone knows, demand drops during the night, and a considerable amount of extra power becomes available.

"Accordingly, the Oblast Executive Committee passed a special resolution," the oblast power spokesmen explain. "We will place 25 electric boilers in service by this winter and 80 next year. In 1987, we will install 150 more. During low-demand time, the water in these boilers will be heated almost to the boiling point for use in the morning to meet the heating needs of residences, dairymen, hog- and cattleraisers in addition to recreation centers, clubs,

houses of culture, libraries and clinics. The hot-water reserve will last till three or four in the afternoon.

In the village of Krasnoye near Belgorod, work on the first water-storage electric-boiler plant is being finished. In October, a complete unit consisting of eight boilers will go into service at the State Farm imeni Batutin in Valuyskiy Rayon. Hot water and heat are electric power innovations in the villages of Belgorod Oblast.

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CSO: 1822/72

NON-NUCLEAR POWER

UDC 620.9.001.18

TES RECONSTRUCTION IN EUROPEAN USSR DISCUSSED

Moscow TEPOENERGETIKA in Russian No 7, Jul 85 pp 2-6

[Article by V. I. Dobrokhotov, doctor of technical sciences, L. A. Melent'yev, academician, Yu. A. Folin, engineer, and A. G. Shcheglov, candidate of technical sciences, State Committee for Science and Technology and USSR Academy of Sciences]

[Abstract] The long-term development of power generation in the European USSR has two main features: 1) the need to improve the energy balance by increasing the proportion of nuclear and solid fuel, while temporarily increasing the use of natural gas, and 2) the need to greatly improve the ability of fossil-fuel TES equipment to perform peak-load service. Most of the peak load until now was covered by GES and multiple-unit TES retrofitted for peak-load service; these sources are gradually reaching their limits of development. Due to the construction of AES, TES base-load capacity must be used more frequently for semi-peak- and peak-load service, resulting in poorer performance and greater equipment wear. Criteria of obsolescence and physical wear are given for determining which capacity should be rebuilt and which should be replaced; the delay in producing high-capacity peak-load TES equipment (development began in the early 1970's) has made this problem more complex. The potential of new 210-MW and 500-MW condensing generating units, gas-turbine units, steam-gas units and magnetohydrodynamic units for peak-load service is discussed. Recommendations are given on which types of equipment should be taken out of service and which should be rebuilt. The development of peak-load equipment and production of gas turbines should be accelerated. References: 8 Russian.

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CSO: 1822/292

NON-NUCLEAR POWER

BRIEFS

**LENINGRAD TURBINE PRODUCTION**--Highly economical 800,000-kW power units will be the cornerstone of the Zapadno-Sibirskiy Power Complex. A series of these turbines, designed for power stations in this area, is under construction at the Leningradskiy Metallichесkiy Zavod Association. The third 800,000-kW turbine was shipped from the Leningrad plant to the Surgutskaya State Regional Power Plant in Tyumenskaya Oblast at the end of September. Yesterday, work got under way in the enterprise's preparatory departments on the fourth turbine for this plant, which has become the powerhouse of the oil- and gas-producing region. These turbines are part of a modernized series of units and are over 1% more efficient than the first series. This means that these units will save several thousand metric tons of fuel to produce the same amount of power, utilizing the rich resources of Siberia more economically. Similar turbines are now being made at the Leningrad plant for the Berezovskaya and Permskaya thermal power plants. [By S. Davydov] [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 30 Oct 85 p 4] 8844

**SOVIET-BULGARIAN COOPERATION**--Sofia has received good news from the Starozagorski District, which lies in the center of the country. The second 210,000-kW unit this year has been placed on stream at the Maritsa-Vostok-2 Thermal Power Plant. It was installed far faster than the last one. The main equipment is from the USSR. Soviet specialists actively took part in its installation and adjustment. Six units with a combined capacity exceeding a million kilowatts are now in operation at Maritsa-Vostok-2, which burns coal mined nearby. Two more units are planned. Increasing capacity based on local resources is one of the fundamental trends of power development in the People's Republic of Bulgaria. [By V. Zakharko, IZVESTIYA correspondent in Sofia] [Excerpts] [Moscow IZVESTIYA in Russian 10 Oct 85 p 5] 8844

**FIFTH UNIT FOR SAKMARSKAYA PLANT**--The Sakmarskaya Heat and Electric Power Plant, built for the silk combine, having upgraded its capacity, now supplies almost all of rapidly growing Orenburg. The fifth power unit is now being built here. Its start-up will greatly improve the supply of heat and electricity to the city. There are fears that the unit will not be ready by the target date, October 30. [By Inspector S. Rekubratskiy, People's Municipal Control Committee, Senior Engineer G. Lebedev, Orenburggazpromenergiya Administration, and PRAVDA Correspondent G. Sazonov in Orenburg] [Excerpts] [Moscow PRAVDA in Russian 10 Oct 85 p 3] 8844

**SURGUT PLANT IN SERVICE**--Two power units at the Surgutskaya State Regional Power Plant (GRES) have been placed in heating service. When all the small uneconomical boiler units are replaced by a single heating network, about 1,000 workers in Surgut will be released from low-productivity labor, according to GRES Director V. Gubachev. Annual savings from centralizing heat supply will be 280,000 metric tons of ideal fuel. The plant will produce 260,000 kilocalories per hour. [By L. Kaybysheva in Surgut] [Text] Moscow IZVESTIYA in Russian 19 Oct 85 p 3] 8844

**FUEL SAVINGS**--New burners have been installed on three boilers at the Irklin-skaya State Regional Power Plant in Orenburg Oblast. These burners will considerably improve fuel efficiency and reduce air pollution. The new installation will double time between boiler repairs. Due to more efficient fuel consumption and a reduction in operating costs, a single burner saves 47,000 rubles a year. [By Yu. Stepanov in Orenburg] [Excerpts] Moscow SOTSIALISTICHESKAYA INDUSTRYIA in Russian 10 Oct 85 p 2] 8844

**PROBLEMS AVOIDED AT NOVOCHERKASSKAYA GRES**--Following preventive maintenance, Unit 6 at the Novocherkasskaya State Regional Power Plant (GRES) was placed back in service exactly on schedule. Concentrating efforts in critical areas, repairmen and operating personnel organized labor in contract brigades, finishing ahead of schedule. Specialists from the Novocherkasskaya GRES underwent particularly thorough preparations. The fact is that many units are currently operating at maximum capacity. It has also been said that in the last few years ash content in the fuel has been rising. This requires more boiler clean-out effort and wears out equipment faster. It was thus decided to undertake a complete overhaul now of Power Units 1 and 5 and preventive and medium maintenance of the other six units. Power personnel agreed beforehand on the delivery time of parts and components and drew up a work schedule. However, in the process of repairing Unit 3, it was unexpectedly discovered that it needed major repairs. It turned out that repairs were done under the threat of a breakdown, and many enterprises in Rostovskaya Oblast and the Kalmytskaya ASSR depend on uninterrupted electrical supply from the Novocherkasskaya GRES. Repairs on Unit 3 are now in the final stages. Power personnel resolved to comply strictly with the schedule for winter preparations. [By V. Bondarenko, TASS correspondent] [Excerpts] Moscow SOTSIALISTICHESKAYA INDUSTRYIA in Russian 8 Sep 85 p 1] 8844

**SECOND UNIT AT MAYNSKAYA GES**--The second unit at the Maynskaya Hydroelectric Power Plant (GES) has been placed in service. The third and last unit will be delivered on the 68th anniversary of the Great October Revolution. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 40, Oct 85 p 73] 8844

**POWER LINE FOR BAM**--Another 220 transmission line linking remote settlements along the Baikal-Amur mainline with the Zeyskaya Hydroelectric Plant has been placed in service. Izhak and Tungala stations and Ogoron settlements now have uninterrupted power supply. Although the length of the new power line, a total of 147 km, is not impressive by BAM standards, construction workers had to cope with a number of obstacles. The right-of-way traversed mountain ranges inaccessible to conventional equipment. Helicopters assisted by delivering tower components and reinforced concrete units to mountain tops. [Text] [Moscow SOTSI-ALISTICHESKAYA INDUSTRIYA in Russian 14 Sep 85 p 2] 8844

**HIGHEST SMOKESTACK**--The world's highest smokestack is being built at the Eki-bastuzsky Fuel and Power Complex. The smokestack at the second state regional power plant of the unique power network already looks impressive. Looking like a rocket with its reinforced concrete stabilizers at the base, it rises into the sky high above the steppe. It is designed to be 420 m tall. At that height, in the opinion of specialists, coal ash from the boilers will be negligible from the point of view of air pollution. [By A. Demishev in Ekibastuz] [Text] [Moscow TRUD in Russian 22 Sep 85 p 4] 8844

**POWER LINE TO GAS FIELD**--Chardzhou--Until recently, dependable power supply to drilling rigs and producing wells was a sore point in the Beurdeshnik gas fields. Fuel for autonomous diesel-generator power plants scattered in the Central Karakum was not always delivered on schedule. And that affected gas production and the quality of field gas treatment. Now this problem at the huge gas and gas condensate field has been successfully resolved. Power-line workers stretched Transmission Line 110 line 82 km across the sand dunes, built a large substation and connected the field to the unified republic power grid. Centralization of power supply will greatly enable gas workers to improve productivity and economic performance, increase the volume of gas delivered to the Central Asia-Tsentr Trunk Gas Pipeline and save thousands of metric tons of a highly valuable national resource: diesel fuel. [By S. Kim] [Text] [Moscow SELSKAYA ZHIZN in Russian 29 Sep 85 p 1] 8844

**POWER FROM THE SAYANS**--Special Correspondent A. Shcherbakov reports that the second unit at the Maynskaya Hydroelectric Power Plant (GES) has been placed in service. By Siberian standards, its 107-MW capacity is comparatively small, but the purpose of the Maynskaya GES is not limited to supplying power to the Unified Siberian Power Grid. It will operate as a current overload regulator [kontrregulyator] to the entire hydroelectric system, assuring normal operation of its larger sister plant, the Sayano-Shushenskaya GES and stabilizing water levels in the upper Yenisey. [Excerpts] [Moscow IZVESTIYA in Russian 30 Sep 85 p 1] 8844

**50-KILOMETER TRANSMISSION LINE FINISHED EARLY**--Power from the state power grid was supplied to the remote Kurchumskiy Rayon over the 50-km Derikty-Bulak-Kurchum Line. Brigades from the Altayenergo Association finished the line six weeks ahead of schedule. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 85 p 2] 8844

**TRANSMISSION LINE TO RESERVOIR**--A 200-km power line has linked the largest power plant in Turkmenistan, the Maryyskaya State Regional Power Plant imeni 50-letiya SSSR, with the largest hydro construction project in the republic, the Zeidskoye Reservoir in the southeastern Karakum. When the power substation at the reservoir was placed in service, electric power from the Unified Central Asian Power Grid became available here via the high-voltage transmission line. Construction workers built the main line under complex Karakum conditions. Sand dunes, intense heat, sandstorms and the lack of highways complicated work. Experience acquired under the current five-year plan in the construction of the MaryGRES-Karakul 500 Transmission Line across the Karakum helped to overcome difficulties. Cooperation with canal operators helped solve the problem of delivering shipments: barges were used. Scientists' recommendations were followed to cope with moving sand dunes where support towers had to be located. [By TURKMENINFORM Correspondent Yu. Shakhnazarov] [Excerpts] [Ashkhabad TURKMENSKAYA ISKRA in Russian 8 Sep 85 p 2] 8844

**FIRST PHASE COMPLETED AT ZHINVALSKIY PLANT**--Deep in the earth under the bed of the Aragvi River, turbine vanes began to turn: the first phase of the Zhinvalski Hydroelectric Plant, whose construction was ordered in decrees promulgated at the 26th Congress of the CPSU, was placed in service. The two 65,000-kW turbines comprising the first phase began to generate power. All four units at the plant will be operating by the end of the year. [By IZVESTIYA's Special Correspondent in Tbilisi; [Excerpts] [Moscow IZVESTIYA in Russian 30 Oct 85 p 1] 8844

**ZELENCHUKSKAYA GRES CONSTRUCTION BEGUN**--Sary-Tyuz (Karachayev-Cherkesskaya Autonomous Oblast)--5. Construction on the Zelenchukskaya Hydroelectric Power Plant began near the aul of Sary-Tyuz. Four 80,000-kW generators will be powered by the hydraulic head of mountain rivers: the Bolshoy Zelenchuk, the Malyy Zelenchuk, the Aksaut and the Marukha. A 34-km canal diverts the rivers into a single channel. The canal will supply water to the reservoir under round-the-clock control. The reservoir is located 240 m above the powerhouse. Water will drop to the hydrogenerators from that height, generating electricity in 1987. Further down the Kuban, two more hydroelectric power plants will be built: the Verkhnekrasnogorskaya and the Nizhnekrasnogorskaya plants. The entire power complex will have a 530,000-kW capacity. The construction of these facilities also has a land-reclamation purpose. Their completion will make the Kuban deeper than the runoff from mountain streams now allows. The scale of irrigation along the Bolshoy Stavropolskiy Canal will increase. It is estimated that the canal will get an additional 200-220 cu m of water per second. This will translate into larger crop yields. [By V. Pankratov, PRAVDA correspondent] [Text] Moscow PRAVDA in Russian 6 Oct 85 p 2] 8844

**HYDROELECTRIC TUNNEL COMPLETED**--Construction workers at the Roginskaya Hydroelectric Power Plant in the Tajik SSR accomplished one of the main goals of Socialist duty in honor of the 27th Congress of the CPSU: boring brigades working toward each other met in another tunnel. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 43, Oct 85 p 3] 8844

POWER GENERATION RECORD SET--A meter at the Bratskaya Hydroelectric Power Plant [GES] imeni 50-letiya Velikovo Oktyabrya recorded 450 billion kW-hr. The famous plant is the first in the world to achieve this. For the last several five-year periods, this hydroelectric power plant on the Angara has been the proving ground for scientific and technical innovations and the standard for modernization and re-tooling. Consequently, the capacity of its units grew by 400,000 kW. The Bratskaya GES is a model of economical, efficient operation: the resources expended to build it have been recouped ninefold, and funds used to modernize equipment have been repaid sevenfold. Today is a power peak for the plant. The man-made reservoir is full and all power units are running. [By V. Monakhov in Bratsk] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 26 Sep 85 p 2] 8844

1 MILLION RUBLES SAVED--At the beginning of the five-year plan, efficiency experts at the Sayano-Shushenskaya Hydroelectric Power Plant obligated themselves to make whatever improvements were necessary to save a million rubles over the five years. It could have been an impossible goal, because the plant was the last word in domestic science and technology. Even so, the experts are finding ways to improve equipment design and raise the quality of maintenance and repair work. A single innovation made here, which prevents the formation of sediment in the water system for cooling the generators, saved 154,000 rubles. The inventors and experts have already saved their millionth ruble. [By V. Sbitnev, special correspondent in Sayanogorsk] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russia 13 Aug 85 p 1] 8844

TASH-KUMYRSKAYA GES TO START UP SOON--The Tash-Kumyrskaya Hydroelectric Power Plant (GES) in Kirghizia, whose construction was decreed at the 26th Congress of the CPSU, is now in the tense pre-startup phase. Assembly operations in the turbine room of the first unit are nearing completion. Workers are employing the large-component turbine assembly method, which was used successfully at the Kurpsayskaya GES and other plants in Central Asia. [Text] [Moscow PRAVDA in Russian 23 Sep 85 p 2] 8844

16TH UNIT AT NIZHNEKAMSKAYA GES--The 16th and last unit is under construction at the Nizhnekamskaya Hydroelectric Power Plant (GES) in the Tatar ASSR. The plant supplies power to the region's enterprises while construction continues. Over seven billion kW-hr of power have been generated since the day the plant started operations. [Excerpt] [Moscow PRAVDA in Russian 14 Oct 85 p 2] 8844

NORTHERNMOST POWER LINE--Vorkuta, the city of boilers beyond the Arctic Circle, was switched into the national power grid a few days ago. Workers of the Komienergostroy Trust placed the 200-km plus Inta-Vorkuta line in service here. It is the country's northernmost power line. [By V. Krugovskiy, SOTSIALISTICHESKAYA INDUSTRIYA's special correspondent in Ukhta] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Sep 85 p 1] 8844

UNIT AT SLAVYANSKAYA GRES REPAIRED--An 800,000-kW unit at the Slavyanskaya State Regional Power Plant (GRES) has been placed back on stream following repairs. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 85 p 2] 8844

ZHINVALSKAYA GES IN SERVICE--Dusheti, Georgian SSR--Yesterday was a big day at the Zhinvalskaya Hydroelectric Power Plant (GES). The first two turbines were started up in the generator room over 70 m down in the depths of the dam. Two more turbines will be placed in service by the end of the year, and the republic's power system will start receiving an additional 130,000 kW. [Excerpts] [Moscow PRAVDA in Russian 2 Oct 85 p 3] 8844

VOLZHSKAYA GES FULFILLS PLAN--The collective at the Volzhskaya Hydroelectric Power Plant (GES) imeni 22nd Congress of the CPSU fulfilled its five-year plan. It supplied 56.7 billion kW-hr of power to the country's unified power grid, which is 1.8 billion more than was generated during the 10th Five-Year Plan. The collective has assumed the obligation of generating another three billion kW-hr in honor of the 27th Party Congress by year's end. [By V. Stepnov, PRAVDA correspondent in Volgogradskaya Oblast] [Excerpt] [Moscow PRAVDA in Russian 28 Sep 85 p 1] 8844

CSO: 1822/72

PIPELINE CONSTRUCTION

UKRAINIAN OFFICIAL DISCUSSES REPUBLIC PIPELINE GROWTH

Kiev PRAVDA UKRAINY in Russian 26 Jul 85 p 1

[Article by A. Malyenko from Kiev: "Steel Channels for Petroleum Products"]

[Text] Since the start of the Five Year Plan the capacity and length of petroleum product pipelines has doubled in our republic. Today 43 percent of refined gasoline and diesel fuel is delivered to consumers by pipeline transport. Such a significant result as this took shape at the end of the previous year during the 11th Five Year Plan. But, in studying the importance of public owned pipelines, the workers of the Ukrainian SSR State Committee for the supply of petroleum products, obligated themselves to complete their objectives of the Five Year Plan by building the underground lines five months before the deadline. Now it is possible to say that few kilometers of pipeline separate them from their set goal.

PRAVDA UKRAINY correspondent [A. Malyenko] met with the republic's deputy chairman of Goskomneftelprodukt, P. A. Horoshun and asked him to answer a group of questions.

[Question] Petr Aleksandrovich, what sort of advantage does the use of pipelines give compared with traditional methods of hauling petroleum products in railroad tank cars?

[Answer] By the most conservative calculations, the transportation of each ton of liquid cargo by pipeline is three times cheaper than by railroad. In four years of the Five Year Plan this saved 75 million rubles in transportation expenses. Also, one cannot ignore the cost saving of the advantages of pipeline transport; its use eliminates losses of petroleum products, and therefore, the contamination of the surrounding environment.

Or we'll take the reliability of the oil supply. The past severe winter hindered surface types of transport, but the uniform operation of pipelines transport was not affected by poor weather conditions. Because of this, interruptions in fuel oil supplies occur in those areas not yet reached by oil pipelines. By the way, they are already laid in nineteen oblasts in

the republic. And the work is not standing still for the others; in the following years they all will link into the pipeline net.

I must say that with the expansion of the net, pipe laying to some extent has changed its purpose. If in the beginning they intended first of all to unload the oil refineries, now the task is to deliver by pipeline the production of these plants to important consumers without transfer to rail haulage."

[Question] In this way underground mains will make it possible to substantially unburden the railroads.

[Answer] Consider this figure; just last year thanks to oil pipelines 240,000 rail tank cars were freed in the republic. In this respect, a recently started up main line, the Lisichansk-Trudovaya-Donetsk-Zhdanov is instructive. Thus such a large consumer of petroleum products like the Donetsk Oblast began to receive them totally by pipeline, and not by railroad.

Today a fan-shaped pattern of fuel oil lines with numerous branches spreads from the Lisichansk oil refinery. The builders are planning to put into use the next main line to Voroshilovgrad in coming months. It is predicted that in the future they will have laid two more pipelines to Crimea and to Kharkov, and with their completion they will be able to completely abandon the services of the railroad; their entire output will travel by pipeline.

[Question] How will the pipeline transport [system] continue developing in the 12th Five Year Plan?

[Answer] In the UkrSSR Goskomefteprodukt Construction Program, the construction of pipelines like at the present, will occupy an important place; tens of millions of rubles are being allocated for this. The goal at the end of the next Five Year Plan is to pump significantly more light petroleum products. The routes for the lines have been picked with the consideration that in following years all river oil depots will be eliminated, which are a source of water resource contamination."

Of course in order to carry out what has been planned, even more rapid levels of construction are needed, unimaginable without present technology, technological innovations, and without improvements in the entire construction process. And today one can see quite a bit of innovation on the construction lines. Let us mention that there is a specialized machine for the construction of crossings under highways and railroads, designed by the specialists of our committee. With its help workers make such a crossing during a workshift, while before not less than a week was spent on this. The set-up of the Freza [Machine] allows the connection of a branch to an operating oil pipeline without interrupting the flow of pumped fuel.

The level of servicing of the pipelines does not meet present day requirements. Apparently, because of the big advantages of pipeline transport, issues relating to improvement in exploitation have been left on the back burner. For instance, of all the valves operating on the pipelines and oil

depots, only a small part are mechanized. A similar picture exists with pumping equipment.

There are, of course, examples of another kind. In Sevastopol, and in Borispol, Kiev Oblast, telemechanical control systems are working well; with the help of automation, they make it possible to control transport and discharge of liquid cargoes along the entire extent of the main line. But this is only the first experiment in using remote control facilities. What is needed is for the oil pipelines be equipped with them everywhere.

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CSO: 1822/34

## PIPELINE CONSTRUCTION

### PIPELINE CONSTRUCTION PLANS, DELAYS DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 29, Jul 85 p 4

[Article by V. Voznyak: "Half Year Objectives Achieved"]

[Text] The half year task for set construction and assembly projects and the start-up of basic production capacities at Western Siberian oil fields has been fulfilled. Glavyumennftegazstroy (Manager M. Chizhevskiy) turned over for exploitation petroleum processing facilities at the Severo-Varyeganskiy, Talenskiy, Holmogorskiy and Trekhozernyy Fields, 18 booster pump stations that pump 131,000 cubic meters of oil per day, and 15 branch pump stations capable of ensuring the pumping of 114,000 cubic meters of water per day, as well as reservoir storage units, and a series of other facilities.

By the half year, about 2500 kilometers of oil pipelines, waterlines, oil-handling and gas-handling systems began operating for Minnefteprom' compared with 2,033 kilometers planned. The greatest contribution in over-fulfilling the set plans was given by the Glavyumentruboprovodsroy (Manager V Pavlyuchenko) and Glavsibtruboprovodsroy (Manager P. Shabanov) collectives.

The results of the half year confirm the correctness of the course taken by Minnetegazstroy to concentrate its efforts on the most important projects of the current year. Reassignment of additional spreads from 14 pipe-laying and construction trusts from other areas of the country to western Siberia has had a favorable effect.

In the summer time, construction work of commercial pipelines that cross many lakes and rivers, and West Siberian lowland areas is significantly complicated. It is necessary to use all-terrain vehicles, new methods of pipe laying, and the building of log roads in many places. Along with that the situation with oil production in the region is forcing a maximum speedup in construction and especially the start-up of the industrial pipelines. Each new main line makes it possible to increase the production potential of the oil industry, and to get a measureable addition of raw material for the national economy.

As we know, higher targets have been adopted for 1985 to expand capacities by finding new oil-bearing areas. Fifteen fields must still be brought into

production. For the half year, 10 new deposits were brought into exploitation while the plan target was four. The Yershovoye, Khokhryakovskoye, Permyakovskoye, Novo-Purpeyskoye, Barsukovskoye, and Zapadno-Solkinskoye deposits were brought into production ahead of schedule.

However, the development of industrial plants is moving too slowly and piecemeal. The oil workers are behind in start up of development wells and the boring of production wells. Minneftegazstroy subdivisions are behind with the completion of work on the construction of oil drilling networks, oil lines, and shift [workers] housing complexes for servies personnel. Minenergo USSR violated deadlines for start up of a number of power lines and substantions. Disputions are continuing in supplying construction sites with equipment.

During the second half year, USSR Minneftegazstroy, Minnefteprom, and Minenergo organizations must speed up the outfitting of the Pokamasovskiy, Severo-Potochuiy, Tarasovskiy and Navagalskiy deposits. It is important to forcefully implement drilling and bring the drill holes into production in the Vostochno-Surgutskiy, Lor-Eganskiy, Pogranichniy, and Permyakovskiy deposits.

In the current year the Minneftegazstroy will have to reconstruct pipelines totaling 200 kilometers at operating oil fields in the Tyunen area. Meanwhile, the completion of these efforts is underway at a slow pace. The buyer has delayed issuing the project budget documentation and delivery of metal pipes. Minnefteprom and Minneftegazstroy must take additional steps to correct the existing situation.

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PIPELINE CONSTRUCTION

NEW CASPIAN UNDERWATER PIPELINE OPENED

Baku VYSHKA in Russian 11 Apr 85 p 1

[Article by A. Gol'denberg: "The Underwater Lines of the Caspian"]

[Excerpts] A new underwater line has been traced onto the map of the Caspian Sea. A promising oil deposit imeni 28 April has added yet another line to the shore. The 15 kilometer main oil line has become operational. It starts from the second stationary platform, where 10 high-speed wells are at work, and runs to elevated platform No 300 of the pile-supported small town Neftyanye Kamni. From here the fuel of this underwater repository is transported through an existing line to the mainland. The combined method, where the pipeline was built from two directions at once, was used for the first time at a great depth. The crew of the specialized pipelaying vessel "Suleyman Vezirov" and the installation workers of the second construction and installation administration worked towards each other, laying the lash supports from the pontoons using the so-called free submerging method.

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CSO: 1822/251

## PIPELINE CONSTRUCTION

### PROGRESS PIPELINE PLANS OUTLINED

Moscow TRUD in Russian 23 May 85 p 2

[Article by G. Sudobin: "Route of Courage," under rubric "At Shockworker Construction Sites of the Five-Year Plan"]

[Excerpts] The unique system of transcontinental Urengoy gas pipelines has been activated ahead of schedule. The next step: building six gas mainlines from Yamburg.

Rapid increase in the volume of Siberian gas produced and transported has become one of the main links of the National Energy Program.

The growth rates of the country's gas industry are swift. In the last 5-year plan, the country's gas recovery increased by 146 billion cubic meters. In the present 5-year plan this increment already will amount to about 200 billion meters. Without doubt the Urengoy deposit is the nation's major one at present. Its reserves are enormous. Economists calculate that the treasures of this underground repository will supply a large industrially-developed region of 40 million people with fuel, raw materials, electrical energy and household gas on an annual basis.

An unparalleled six-line gas transportation complex more than 20,000 km in length has been built on the basis of the Urengoy deposit in an unprecedently short time. Ahead-of-schedule activation of the system has provided the national economy with more than 14 billion cu m of gas over plan.

Today new and critical challenges confront the workers of this sector. First of all, the Yamburg gas-condensate deposit in Tyumen Oblast must be developed. This is an important step in the realization of the USSR's Energy Program in the 12th 5-year plan. From both the Yamburg and Urengoy deposits 6 large-diameter gas mainlines must reach the center of the nation. They are: Yamburg-Yelets-Kremenchug (4,459 km), Yamburg-Transcaucacus (4,530 km), Yamburg-Gorkiy-Tula (3,155 km), Yamburg-Tula-Kiev (3,405 km);

Yamburg-Volga area (2,757 km) and the export Yamburg-Uzhgorod line (4,571 km), which has been given the name Progress. Work is already underway at the first of these, with more than 1500 km of pipes welded together into a line. The experience acquired will be widely used on the new routes. In

particular, the creation of the so-called unified technological corridor. Our nation was the first in the world to apply this principle.

The system of parallel Urengoy "threads" has made it possible to create a series of permanent and comfortable settlements along the entire route. The distance between them was chosen so that the construction crews would not have to haul their vans along the routes. A subdivision is assigned a specific portion of the corridor. When one "thread" has been completed, you move on to the second, then the third, etc. So the line workers have practically a settled way of life. They are permanently located in one climate zone, which has a positive effect on their work and living conditions.

The pace of activities will intensify further still. On the Yamburg line robots have been introduced from the first days, with automatic welding across the entire technical chain and the use everywhere of pipes with plant insulation. High-power excavating equipment is used here, plus all-weather vehicles with high cross-country capability. The equipment and technology for carrying out construction work in swamp and flooded lands in summer has been developed. Thanks to these measures the productivity of the production lines will grow 1.5-1.7 times.

Modular construction, enabling fast-paced on-land work, has become dominant in this sector. Unique plant-contruction combines have been created for this. Entire bays of future shops are put together here, they are filled with the equipment and then in the form of finished container-blocks distatched to the sites of the compressor and pumping stations and the fields.

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CSO: 1822/251

PIPELINE CONSTRUCTION

REPORT ON CONSTRUCTION OF FIRST YAMBURG GAS PIPELINE

Construction Records Described

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 31 Aug 85 p 2

[Article by B. Lvov: "The Yamburg Right-of-Way is Growing"]

[Text] It's a great holiday along the Yamburg right-of-way. On the eve of the 50th anniversary of the Stakhanovite movement the second thousand kilometers were completed of the sectional pipeline giant. Sector by sector it is turned over to the workers of Mingazprom [Ministry of the Gas Industry] and put into operation, thus adding millions of cubic meters of gas to the country's fuel-energy balance.

This the first of six gas pipelines on the Yamburg-Center-West route to be put into service in the 12th Five-Year Plan. Having passed the 2,000 kilometer mark, it keeps on growing by six-eight kilometers per day. The right-of-way is growing under very difficult natural and climatic conditions: permafrost, swampy tundra, endless expanse of taiga, mountain ranges and rivers, each of which must be crossed. Add to that a temperature range from minus 50 degrees to plus 30. But there can be no slackening of the tempo: the construction workers have pledged to complete the line portion of the pipeline and the top priority compressor stations by the opening of the 27th Party Congress. To do that they must set records every day. And that is what the construction workers are doing.

But records are not unexpected. They are possible only as the result of careful preparation. The success of the rapid construction of the Urengoy and Yamburg trunk lines is to be found mainly in the organization of the work on wholly new principles based on large-scale integrated components and detachments operating through a single follow-through team, with pay based on the completed product -- a kilometer of finished pipeline. The detachments are furnished with power tools, which makes it possible to integrate the mechanization of individual processes and introduce elements of automation. The total capacity of the machinery in a detachment averages 14,000 kW, and the power equipment available here per worker is more than 50 kW.

All this makes it possible for the leading production workers to utilize their resources to the full and to overcome the ever more difficult limits that affect

the others. A remarkable fact: the record of one collective becomes the attainment of the rest, or to put it another way -- the norm. For example, the detachment of Hero of Socialist Labor V. Belyayeva completed an 80.5 kilometer sector on the previous right-of-way in just five months. The terrain of the right-of-way was really very difficult, it was crossed by three rail lines and a highway, 30 culverts, and 15 ravines, gullies and streams. In the past this collective would have needed nearly twice the time to negotiate a similar right-of-way.

This record did not stand very long. The detachments of A. Buyanikin and I. Shaykhutdinov, competing with V. Belyayev's component, also completed the multi-kilometer sectors of pipeline assigned to them in the Trans-Volga in just a few months. Advanced methods of accelerated construction are also in the repertoire of the collectives led by A. Rekoshetov and A. Krakhmalev.

These Stakhanovite collectives were in the vanguard of those that were the first to step over into the third thousand kilometers.

#### Accelerated Pipelaying Achieved

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Jul 85 p 1

[Article by A. Suldin, TASS correspondent: "Right-of Way Under Construction, Right-of-Way in Service"]

[Text] The construction workers on the Yamburg--Yelets-1 transcontinental gas pipeline have achieved a great labor success. This 3,150 kilometer trunk line has its origin in a major gas field beyond the Arctic Circle, and terminates in Lepetsk Oblast. Yesterday the right-of-way workers crossed their "equator" -- the pipe for half the length of the trunk line has been welded, insulated and laid in the trench. This has been announced by the Main Dispatcher Administration of the Ministry of Construction of Petroleum and Gas Industry Enterprises.

The Yamburg-Yelets gas pipeline is an above-plan construction project of the five year plan. The six preceding right-of-ways laid from Urengoy were built considerably ahead of time. The time saved, just short of a year, made it possible to lay the above-plan trunk line.

Such great acceleration is the result of the efficient use of advanced equipment and bold engineering solutions. The ministry's press center has been of great help in disseminating advanced experience. Together with several newspapers such as GORKOVSKAYA PRAVDA and Perm's ZVEZDA, separate editorial offices were set up right on the right-of-way. This made it possible to efficiently report anything new, and to collate advanced experience.

The Yamburg-Yelets right-of-way has its special features. It was the first to implement the stagewise putting into service of individual sectors. For example, 250 kilometers of the trunk line are already receiving gas and have begun functioning in the country's gas-supply system. This means many millions of cubic meters of gas above plan delivered to the country's enterprises and major industrial centers.

The rate of construction of the above-plan gas pipeline is growing. The construction workers are full of determination to fulfill their increased socialist commitments -- to complete all the line work on the Yamburg-Yelets right-of-way and to build several compressor stations for this trunk line by the 27th Party Congress.

This efficient rhythm is now also typical of other construction projects undertaken by the ministry's components. The six-month plan has been successfully completed. And it is very important that the construction workers have fulfilled their mission of gas-field construction in Western Siberia.

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PIPELINE CONSTRUCTION

PIPELINE CONSTRUCTION OFFICIALS FINED

Moscow IZVESTIYA in Russian 21 May 1985 p 2

[Unsigned article under the rubric "In the USSR People's Control Committee": "The Price of a Sham Document"]

[Text] The Syzran-Volga petroleum products pipeline, intended for the pumping of motor oil, was activated last December, but, as determined by an inspection, with large portions incomplete. On the day it was accepted the hydraulic testing of the pipeline and the overall testing of the installed equipment had not been completed. Of 15 planned cathode protector stations, 5 did not have the electrical equipment installed. Contrary to design, more than 700 meters of pipeline were placed on top of the ground without banking. The designed fencing and lighting of the terminal facilities at the Ulyanovskaya oil depot had not been installed. As a result of the irresponsible approach taken toward conducting the hydraulic tests, many portions of the pipeline froze and require reconstruction work.

The State Acceptance Commission (the chairman is the chief of the Southwest administration for petroleum products mainlines of USSR Goskommefteprodukt [State Committee for the Supply of Petroleum Products] S. Osin'kin) never met as a full commission, and the signatures for the acceptance certificate for operation of the petroleum pipeline were gathered separately from the individual commission members. The majority of them were irresponsible in fulfilling the obligations placed upon them. Thus, the state inspector of the Mid-Volga Basin administration, for regulation of the use and conservation of water of RSFSR Minvodkhoz, [Ministry of Land Aclamation and Water Resources], Ye. Borisevich, did not visit the pipeline route and, unaware of the precise state of affairs, signed the certificate. Ye. Kandalov, chief inspector of the Mid-Volga district administration of USSR Gosgortekhnadzor, signed on the basis of word-of-mouth information provided by S.Osin'kin. In a number of instances people other than commission members signed the certificate. Thus, in the technical standards administration of the fire-prevention detachment of the Kuybyshev Oblast Executive Committee's internal affairs administration, department engineer signed the certificate for the chief, and at Kuybyshevtruboprovodstroy, the trust's director signed for the deputy director. And the fact that a commission member, the chief engineer for project of the Sibgiproneftetrans institute of RFSFR Goskommefteprodukt, agreed to sign the certificate of acceptance for operation of the oil pipeline was reported by telegram by the institute's director.

The Chairman of the State Acceptance Commission, S. Osin'kin, knowing that the oil pipeline could not function due to large portions of it being incomplete and to ice jams, submitted the certificate of its acceptance for operation to USSR Goskomnefteprodukt for approval on 28 December 1984. Moreover, he indicated in a written report that construction work was completely finished and that the project had been provided with personnel and was ready for normal operation. The order approving the acceptance certificate for the pipeline was approved by the deputy chairman of USSR Goskomnefteprodukt, M. Voronin, responsible for large-scale construction in the branch, without on-site verification of the actual situation.

In spite of the great economic significance of the pipeline, which would enable thousands of tank-trucks per year to be freed up, S. Osin'kin and M. Voronin did not take steps to finish what was unfinished. Moreover, according to their statement it will require at least two months to rectify the situation and commission the pipeline. During the January-March period not one ton of oil products has been pumped. Losses from unproductive costs for fuel transportation and for maintenance of the idle pipeline have exceeded 117,000 rubles.

The USSR People's Control Committee has issued a severe reprimand to S. Osin'kin, chief of the Southwest administration of petroleum product USSR Goskomnefteprodukt, for a flagrant breach of state discipline, i.e., acceptance for operation of an unfinished pipeline. He was fined the equivalent of three months' pay. M. Voronin, deputy chairman of USSR Goskomnefteprodukt, was reprimanded.

The statements of M. Voronin and S. Osin'kin, to the effect that the pipeline will be finished and operational as per design in June, were taken into account. S. Osin'kin is to report to a meeting of representatives of the administration's labor collectives concerning the reasons for the breach of state discipline in accepting the pipeline for operation and the measures being taken to eliminate the problems revealed upon verification.

12912/9435  
CSO: 1822/251

PIPELINE CONSTRUCTION

BRIEFS

**START OF NEW LINE--Noyabr'sk (Yamalo-Nenetsk autonomous okrug)--**The pipeline, whose construction has been begun by builders from Krasnodar, will make it possible to increase the oil recovery in the new fields of Tyumen. The first sections of pipe have been brought out to the route, which will link the Tarasovskoye and Muravlenkovskoye deposits. It has been decided to build the new pipeline bidirectionally. Pipe-welding centers have already been set up in several areas. The Krasnodartruboprovodstroy trust is nothing new to Northern Tyumen. Very recently this collective helped the Siberians lay a steel pipeline to Klin. Installation workers from Krasnodar worked on the most difficult portion, the Salymskiye wetlands. Now work parties from the Ukraine, Moscow, Leningrad, Kuybyshov and Tomsk are working in Tyumen Oblast. In this six-month period alone they will lay petroleum pipelines to the fields of five new deposits. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 3 Mar 85 p 1] 12912/9435

**MARI PIPELINE SECTION OPERATIONAL--Izmentsy (Mari ASSR)--**The Mari ASSR portion of the Urengoy-Center-2 gas line is ready to take Siberian gas. A stretch of the route from the village of Pomary to the banks of the Volga was activated yesterday. Despite the harsh snowy winter, work has gone on at an accelerated pace. This has been aided by skillful handling of equipment, use of the collective contract and socialist competition. [Text] [Moscow SEL'SKAYA ZHIZN' 3 Mar 85 p 1] 12912/9435

**GAS MAINLINE FROM YAMBURG--**The first construction crews have arrived at the route for the future gasline, to begin in Yamburg and go through Yelets, Kremenchug, Tiraspol and beyond to the Danube and the Balkans. A 120 km branch line to Odessa is scheduled to be laid from Tiraspol. In Odessa Oblast about 20 gas-distribution stations will be created on the basis of the new gasline. The construction schedule for the gas mainline is tight as it is to be operational next year. Construction work is being done by Ukrglavneftegazstroy, which has previous experience in laying the Trans-European Bratstvo and Soyuz gaslines and has participated in the construction of the Urengay-Pomary-Uzhgorod route. [By F. Chernetskiy] [Text] [Moscow IZVESTIYA 12 Mar 85 p 6] 12912/9435

**GAS FACILITIES PROGRESS NOTED--**The command "Start" has been heard at the Sovetabad gas condensate deposit in the Karakum, the largest in Central Asia. The third pre-transport gas facility has come on line ahead of schedule.

24 January 1986

It has an annual fuel capacity of 5 billion cubic meters. The Mari ASSR portion of the Urenga-Center-2 gasline is ready to take Siberian gas. The Pomary-to-Volga stretch has become operational here. [Text] [Moscow EKONOMICHESKAYA GAZETA No 15, Apr 85 p 3] 12912/9435

**PIPELINE WORK AT POMARY--Mari ASSR**--Specialists from the Tatnefteprovodstroy trust have begun construction of the Yamburg-Yelets-1 gas pipeline on the outskirts of the old Mari village of Pomary. This will be the fourth steel artery laid here. With its skillful utilization of contemporary welding technology and introduction of the brigade contract, the production line collective has undertaken to complete work on a 66-kilometer portion this year. [Text] [Moscow SEL'SKAYA ZHIZN' 2 Apr 85 p 1] 12912/9435

**YAMBURG PIPELINE DESIGNER NAMED--**The Donets Southern Scientific Research Institute for Pipeline and Gas Industry Enterprise Planning has been named as chief designer of the gigantic new Progress gas pipeline, which is to pump the gas of the artic Yamburg deposit to the enterprises of our country and those of the CEMA countries. It will be built through the joint efforts of the organizations of the states of the socialist community. The mainline from Yamburg to the western border of the USSR is 4,605 km long, 150 km longer than the Urengoy-Pomary-Uzhgorod gasline. Forty compressor stations, communities for the gas workers, roads, private plots, greenhouse combines and many other facilities will be built. Soviet builders, who are very experienced in the working conditions of the polar region, will lay the pipeline, while workers and engineers from CEMA countries are to build the compressor stations, living quarters and economic facilities. The new gasline is scheduled for completion in 1987. [Text] [Moscow STROITEL'STVO TRUBOPROVODOV No 5, May 1985 p 9] 12912/9435

**MORDOVIAN GASIFICATION PROGRESS--**Two more large rayons of the Mordovian ASSR-Lyambirskiy and Romodanovskiy have received the blue fuel from the gas mainlines. Low-cost natural gas has begun to flow here ahead of schedule along the new diversion arteries. At the initiative of the local soviets of people's deputies in the autonomous republic, workers from the enterprises and organizations of the agro-industrial complex have come to help the construction crews. Thanks to the joint efforts, the annual growth of the length of the gaslines in the rural areas has more than doubled in the present five-year plan. [Text] [Moscow STROITEL'STVO TRUBOPROVODOV No 5, May 1985 p 9] 12912/9435

**ARMENIAN PIPELINES -- Kafan, ASSR --**Natural gas has started to arrive at the industrial enterprises and living quarters of a major industrial center of Armenia -- Kafan. This completes the gasification of three cities of Zangezur -- Goris, Kadzharan and Kafan. The network of gas trunk lines in the high-mountain areas of Armenia is expanding. This makes it possible to convert oil-fired boilers to gas. The total length of fuel lines in the republic has reached more than 6,000 kilometers. [Text] [Moscow SELSKAYA ZHIZN in Russian 8 Sep 85 p 1] 12697

**CENTRAL ASIAN PIPELINE --** Chimkent -- The integrated brigades of the Sredazneftegazstroy Trust have laid the first tens of kilometers of steel pipe on the new right-of-way of the Gazli-Chimkent pipeline. Construction is under way simultaneously in Uzbekistan and Kazakhstan. From the first days the installation workers have been striving to exceed construction norms. By the end of next year blue fuel from the Bukhara gas-producing area will be delivered to the general gas pipeline network of Chimket and other populated places in the oblast. This will make it possible to more widely utilize this gift of nature for the needs of the national economy. [By V. Yelufimov] [Text] [Moscow SELSKAYA ZHIZN in Russian 28 Aug 85 p 1] 12697

**URAL PUMPING STATION --** Nizhnyaya Tura, Sverdlov Oblast -- Going up not far from the old Ural city of Nizhnyaya Tura is the Arbatskaya pumping station of the Kholmogory-Klin oil pipeline, which runs from North Tyumen. The trade route from Russia to Siberia ran through these forest places in the 16th century. Through Northern Ural, where it borders the Western Siberian gas complex, there now run major pipelines that supply natural gas and oil to the country's national economy. At the junction of the old and new the Arbatskaya pumping station and its housing settlement are now being built. [By V. Sintsov] [Text] [Moscow IZVESTIYA in Russian 21 Oct 85 p 2] 12697

**PIPELINE TO FINLAND --** The construction workers laying the Kouvola-Helsinki-Tampere gas pipeline, in which Soviet organizations are taking part, have completed the stage of crossing Lake Vanajavesi. This gas pipeline, which is 250 kilometers long, is being built in accordance with an agreement concluded between the Finnish State corporation Neste and the Tsvetmetpromeksport All-Union Association. Operation of it will make it possible to nearly double deliveries of Soviet gas to our northern neighbor in the next five-year plan. [Text] [Moscow IZVESTIYA in Russian 28 Oct 85 p 1] 12697

CSO: 1822/105

COMPRESSOR STATIONS

CONSTRUCTION PROGRESS AT TURKMENISTAN COMPRESSOR STATION

Askhabad TURKMENSKAYA ISKRA in Russian 1 May 85 p 2

[Article by P. Kul'kov: "A Complex Is Being Born, "under the rubric" At Gas Construction Sites in Turkmenistan"]

[Text] Emerald green leaves cover the trees that encircle the main installations at the Kripichli gas condensate field. Multicolored barkhans extend to the horizon. Scarlet poppies and yellow daisies grow amid green grass. Every day, the mercury in the thermometer climbs still higher, but for the time being, nature in the Kara Kum desert rushes to present people with bright spring colors.

Viktor Bekchanovich Yusopov, deputy Chief of Construction Administration No 4, Naipgazstroy Trust states:

The builders have successfully resolved this problem: they worked three shifts and did everything they could to pass the installation to the next team as fast as possible. Assemblers from the Construction and Installation Administration No 5 of the Sredazneftegazmontazh Trust have already started strapping the compressor plant equipment. Experts from the Construction Administration No 7 of the Tsentrocomplektmontazh Trust will arrive here shortly. For them, corridors where technological service lines and offsite supply lines are to be laid have been prepared well ahead of schedule.

The booster compressor station at Kripichli which is now under construction had been designed in the Turkmen Division of the All-Union Research Institute of Natural Gases. One could think that the designers specified the optimal construction schedule in their project. The teams from the Construction Administration No 4, however, have discovered ways to accelerate the operations and are successfully using them. As a result, the sites where gas-pumping equipment is to be installed were ready by May. Installation of the operator shop with a power unit will commence shortly. Here, prefabrication construction will also permit to work ahead of the projected schedule.

"The Kripichli gas condensate field has been delivering fuel to the Central Asia-Tsentr gas main for many years says Baydzhan Ishmuradov, section supervisor from the Construction Administration No 4. "The pressure in wells has declined. The booster compressor station will enable us to raise the

pressure to the required level, and to deliver more gas to the main. Realizing how important the project is, we decided to fully prepare it for bringing onstream by the end of this year. And even though there is still a lot to be done here, the current high pace of operations proves that our pledge is feasible and will be fulfilled."

13018/9435  
CSO: 1822/29

COMPRESSOR STATIONS

UDC 621:438:62-757.42

ICE PROTECTION, CLEANING FLUID TO IMPROVE GAS TURBINE PERFORMANCE

Moscow GAZOVAYA PROMYSHLENNOST in Russian No 9, Sep 85 pp 30-31

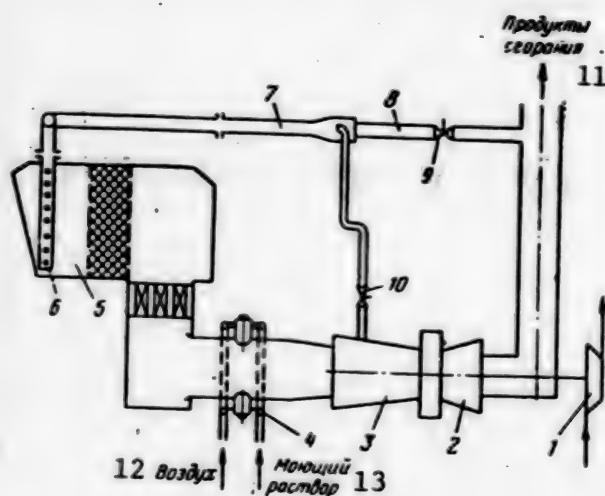
[Article by Yu. A. Ginzburg, V.A. Yakhnis and A.I. Yeshchenko, Turbomotornyy Zavod Production Association and Kiev Polytechnical Institute: "Accessories for the GTN-16 Gas Booster Unit"]

[Text] Rational system designs for deicing and cleaning out the flowpath to improve the technical and economic performance of gas turbine installations.

The Turbomotornyy Zavod Production Association and the Kiev Polytechnical Institute have developed and field tested a deicing system and a cleaning fluid for the GTN-16 gas booster unit.

Following a study of the deicing system of pneumatic clean-out devices and the parts and components of the air supply line in modern gas turbine installations, a thermal deicing system was designed to heat all intake air using combustion exhaust as the heat source. In order to reduce the size and use less metal, improve operating reliability and mix air more efficiently with exhaust gases, an injector (7) was installed on the exhaust supply line (8). Air from the fourth compression stage (3) is fed into the high-pressure nozzle of the injector. In terms of the basic performance of a gas turbine installation (power, efficiency and fuel consumption), this design is almost as good as deicing designs which use exhaust only, since less than  $1 \text{ kg} \cdot \text{sec}^{-1}$  of low-energy air (at 346°K and .215 MPa) is supplied to the injector, which has an estimated injection coefficient of 4-5. This design reduces metal consumption by 32 percent and eliminates the need to install a valve in the exhaust line, which is required in the deicer design for the GTK-101 unit. Theoretical variants of the design supplying only compressed air to the reservoir (5) determined that this was undesirable because it lowered the basic performance characteristics of a gas turbine installation to an unacceptable extent, even when intake air was heated from -5 to +5°C.

Twelve series of tests were run on one of the GTN-16 pilot units under different working loads and weather conditions prior to approval for the industrial use of the deicer design. Results of one of these series of tests are given in Table 1. At a given working load for a gas booster unit, these results describe the capabilities of the deicer system by how much the recycled air is warmed up ( $t_1 - t_0$ ), from a high of 31.1°C (Test 15) to 21.5°C (Test 19). The latter was taken as the minimum design temperature (20°C) to which the air must be



GIN-16 Unit with Deicer and Cleaning Fluid Systems

- |                |                        |             |              |
|----------------|------------------------|-------------|--------------|
| 1. Injector    | 5. Air Cleaner         | 9. Valve    | 13. Cleaning |
| 2. Gas Turbine | 6. Heat Source Tank    | 10. Valve   | Fluid        |
| 3. Compressor  | 7. Injector            | 11. Exhaust |              |
| 4. Jet         | 8. Exhaust Supply Line | 13. Air     |              |

heated and is based on known materials under icing conditions in the gas booster. On the whole, the injector and the deicer system deliver up to  $1 \text{ kg} \cdot \text{sec}^{-1}$  of warm air or about one percent of the total volume passing through the compressor, which is the amount required to prevent the formation of ice at an ambient air temperature of  $-15^\circ\text{C}$ , which establishes the lower limit of conditions likely to cause the components and assemblies of gas-turbine installations to ice up.

TABLE 1

Test No

Parameters	15	16	17	18	19
Ambient Air Temperature $t_0$ , $^\circ\text{C}$	3.8	4	3.5	3.5	3.5
Compressor Air Throughput Volume $G_c$ , $\text{kg} \cdot \text{sec}^{-1}$	74.4	75.2	75.4	75.7	75.9
Injector Air Throughput Volume $G_{air}$ , $\text{kg} \cdot \text{sec}^{-1}$	1.75	1.55	1.36	1.06	0.79
Ratio of Exhaust Volume to Compressor Throughput at Tank $G_T/G_c$ , %	9.9	9.3	8.8	7.8	6.9
Exhaust Temperature at Tank Outlet $t_T$ , $^\circ\text{C}$	315	316	314	311	312
Recycled Air Temperature at Compressor Diverter $t_1$ , $^\circ\text{C}$	34.9	33.1	30.6	27.6	25

The deicer system design was tested on a standard GTN-16 unit at the Krasnoturinskaya Compressor Station. The new deicer design differs from the conventional design in the location of the exhaust supply line, injector and tank design and the location of the connection to the gas booster unit exhaust. Table 2 gives the results of tests in which the valve (see drawing) on the air supply line to the working nozzle was only about 25 percent open. These results confirm the feasibility of the new design for protecting the intake line from ice and thus improving the operating reliability of gas booster units under complex weather conditions.

TABLE 2

Parameters	Without Deicer	With Deicer
Ambient Air Temperature, °C	-2.5	-2.5
Upstream Compressor Temperature, °C	-2.5	9.5
Downstream Compressor Temperature, °C	303	328
Downstream TND Temperature, °C	423	448
Air Compression	10.57	10.43
Compressor Air Throughput, kg·sec <sup>-1</sup>	89.2	86.1
Fuel Consumption, kg·sec <sup>-1</sup>	1.108	1.122
Actual Gas Turbine Power Rating, kW	13,478	13,758
Actual Gas Turbine Fuel Efficiency	0.250	0.249

The GTN-16 unit was equipped with the cleaning fluid system to keep the vane assembly clean. The basic components of the system are a half-cubic-meter tank for mixing the cleaning fluid and eight air jets (4) arranged around the air supply line (see drawing). The distinctive feature of the new cleaning fluid system design is the use of air jets. This feature advances maintenance capabilities (individual jets can be inspected and adjusted while a working unit is being cleaned) and assures dispersion of the cleaning fluid in a finer spray. Theoretical models were used to work out a formula giving the ideal distance between the jet and the rim of the compressor's guide-vane apparatus for accelerating the velocity of the droplets to that of the flowstream ( $v_d > .95 v$ ). Moreover, it is possible not only to improve the uniform dispersion of the cleaning fluid in the chamber, but also to increase the eroding effect of the droplets on the surfaces being cleaned. It is also an operational advantage that hot air supplied downstream from the compressor can clean out the flowpath when the ambient air temperature is below freezing without adding any anti-freeze to the cleaning fluid. As tests of the cleaning fluid used in a pilot GTN-16 unit showed, the air jet assembly sprays 0.15 to 1.5 kg·sec<sup>-1</sup> of fluid with an air supply pressure of 50 to 250 kPa.

Compressor vane cleaning efficiency greatly depends on the composition of the cleaning fluid. A series of physical and chemical analyses was made on samples of flowpath deposits that had accumulated in compressors in various geographical areas. Cleaning fluids currently in use and other fluids with promising chemical reactions on such deposits were also theoretically and physically analyzed. As a result, new cleaning fluids (whose composition is given in Table 3) were developed for GTN-16 units. A distinctive feature of these solutions is the low concentration of active cleaning agents and strong chemical

effect on a wide range of deposits analyzed. An anticorrosion additive in the solution gives it yet another advantage. It should be noted that off-the-shelf synthetic cleaning fluids currently in use at compressor stations (Progress, Lotos, etc.) have a much weaker chemical effect on deposits which accumulate in the flowpath of gas turbine installations.

TABLE 3  
PERCENTAGE COMPOSITION

TYPE OF DEPOSIT	Non-Ionic Surfactant	Substance Containing Amine	Liquid Hydro-carbon-based Organic Solvent
Highly Oily Deposits (over 15 percent)	0.010-0.015	0.01-0.05	10-20
Slightly Oily Deposits	0.010-0.015	0.02-0.05	0-10

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CSO: 1822/70

## COMPRESSOR STATIONS

### PLASMA TECHNOLOGY PROPOSED FOR GAS TURBINE REPAIR

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 May 85 p 2

[Article by General Director of Soyuzturbogaz Scientific and Production Association V. Tverdokhlebov: "Plasma Repairs," under the rubric "Science for Production"]

[Text] Over 500 billion cubic meters of natural gas are transported from production sites to consumers. The gas is driven through the pipes by powerful gas-pumping units. Compressor stations are located every 150 to 200 km along gas mains; this small number of stations keep the mains running.

And now imagine the following situation: the turbine capacity has suddenly declined, and the turbine, as experts say, is not "pulling its weight". It is an unpleasant, but quite common event in recent gas pipeline maintenance operations.

The fact is that turbine parts, like parts of any machine, wear out: rotor blade edges get thinner, thermocouple service life ends. This threatens the smooth performance of the entire pipeline. An increase in the amount of burned fuel may not always succeed in raising the turbine capacity. An overhaul is necessary.

It is no secret that many researchers condescendingly view repairs as something of minor importance compared to designing a new machine or new technology. Meanwhile, after a new gas turbine had been in operation for a year or a year and a half, the clearance between the blades and the rotor can be as large as 1 mm, which decreases the turbine capacity by 6 to 10 percent. The problem gets worse with time. The clearance continues to grow, while the capacity keeps declining. What should be done? Should the blade be replaced with a new one? This question was asked many times. We have over twenty five hundred turbines. Each machine has a thousand blades. If the latter should be replaced on a regular basis, then maybe there is no sense in transporting gas--it gets too expensive. A fundamentally different solution is needed. Such a solution has been found at the Institute of Electric Welding imeni Ye. O. Paton of the Ukrainian SSR Academy of Sciences. The proposal was to repair turbines on site. The innovators were not intimidated by the fact that, until recently, there had been no reliable and simple repair technique. It was this very fact that stimulated engineering research.

Like many other turbine parts that need to be renovated, blades are known to be made out of complex heat-resistant alloys. Welding such alloys, particularly when heterogeneous elements are being connected, requires a highly concentrated heat source. An electron beam could be of help, but it is extremely difficult to use it in the field. Then how about plasma welding? It is simpler, more accessible, and even less expensive. Thanks to the studies conducted at the Institute, plasma has long been utilized for practical purposes. However, rebuilding a turbine with plasma had never been attempted before.

The main problem that had to be resolved was that of concentrated heating in a narrow zone, which required a compressed plasma. Theoretical and experimental studies carried out by Doctor of Technical Sciences V. Gvozdetskiy and his colleagues have shown that this was feasible.

Experienced electric welders R. Gritsevich and A. Sugak assisted the researchers, and here is the desired outcome: the plasma started working almost like an electronic beam.

These were the first steps toward a new effective technique of restoring worn-out blades, flame tubes, reducers, and many more important parts of gas turbines. The unusual engineering solution so much anticipated by all gas mains was found. Now it was necessary to create appropriate power sources and the equipment which would permit a rapid implementation of the new design.

At that point, operators made their contribution. Broad-range operations on implementing the technology, designing the rigging and auxiliary equipment (incidentally, it proved relatively simple) have been carried out in the Tyumen region, the Ukraine, the Central and Volga regions under the supervision of V. Shchegolev, head welder of the Ministry of Gas Industry. Simultaneously, workers were trained to perform new professional duties.

Due to this comprehensive approach toward introduction, the plasma technology was employed at once at 20 repair plants of the Ministry of Gas Industry, which service the turbines of all gas pipelines in the country. Over 150,000 of various units and parts of all types, both Soviet- and foreign-made, are now being rebuilt annually. Downtime of gas-pumping units has been reduced, and their dependability significantly increased. Up to half a billion cubic meters of gas are being saved annually.

Rebuilding is 40 to 50 times less expensive than manufacturing new parts; high quality of repairs and high productivity have been attained.

13018/9435  
CSO: 1822/29

COMPRESSOR STATIONS

BRIEFS

POCHINKOVSKAYA COMPRESSOR STATION PROGRESS--The progress in the construction of the Pochinkovskaya compressor station of the Urengoy-Center II pipeline in Gorky Oblast was discussed at the meeting presided by USSR First Deputy Minister of Construction Yu. Losev. The measures taken have improved the situation. The four-month plan of construction and installation works at the station has been fulfilled 110 percent. The ministry takes steps to ensure that the Pochinkovskaya compressor station be brought onstream before the deadline expires under any circumstances. [By USSR Deputy Minister of Construction A. Yakovlev, responding to the review "At gas pipeline routes in March," No 15] [Moscow EKONOMICHESKAYA GAZETA in Russian, No 22 May 85, p 4] 13018/9435

CSO: 1822/29

RELATED EQUIPMENT

UDC 622.692.4-52

DEVELOPMENT OF AUTOMATED CONTROL SYSTEMS FOR OIL PIPELINES

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 8, Aug 85 pp 56-59

[Article by A. S. Dzhardzhimanov, Glavtransneft, and L. A. Zaytsev, Giprotruboprovod: "Status and Prospects of Development of Automation and Oil Transport Control Systems"]

[Text] The system of petroleum mains continued to undergo intensive development in the 11th Five-Year Plan; significant attention was devoted in this case to raising the system's reliability and using highly effective procedures and technical resources. Among the measures being implemented, mention should be made of wide introduction of procedures for operating oil pipelines under conditions that are optimum from the standpoint of economizing on energy resources, growth of the technical-economic indicators of the work of production equipment, and further development of automated control systems on the basis of full automation and tele-automation of oil main facilities.

Oil pumping stations servicing oil pipelines are outfitted with automated systems that can control the work of the principal equipment and keep the pumping conditions constant without the presence of monitoring personnel at work stations. As a result, 93 percent of the oil pumping stations and 84 percent of the tank farms are now under full automation.

Information-measuring systems for electrical energy accounting (IISE) making it possible to account separately for consumption of electric energy by different consumers and to monitor the active and reactive output during maximum loads on the energy system are now operating at some oil pumping stations.

The automated systems connect to the remote control systems of the pumping stations. Remote control at oil pumping stations is based on the TM-120-1, produced by the Krasnodarskiy Zavod Elektroizmeriteleykh Priborov Production Association. Measurements of pressures and capacities of oil pumping stations and individual machine units, the input currents and voltages, the levels and quantities of oil in tanks, the volume of pumped oil and data on the condition of equipment and the position of the principal valves are transmitted to the regional dispatcher's point (RDP). The average number of parameters transmitted by the remote control system are:

	<u>Oil Pumping Station with Tanks</u>	<u>Intermediate Oil Pumping Station</u>
Remote control . . . . .	30	16
Remote measurement . . . . .	32	25
Remote warning . . . . .	90	60
Remote adjustment . . . . .	2	2

Special attention is being devoted in the 11th Five-Year Plan to remote control for structures of the linear part of oil mains based on the TM-120-2 system. Information is transmitted from the linear units by way of the TM-120-1 system to an RDP, from which valves along the route can be controlled and signals indicating their position and the oil pressure and temperature values along the route can be obtained.

Each year 25-30 systems are introduced (totaling about 3,000 km, computed in relation to a single strand of pipes). A total of 18,000 km of the linear part of oil mains have been outfitted with remote control.

Introduction of remote control systems along pipelines required fulfillment of a large volume of earth-moving operations, carried out by manpower of the UMN [not further identified] itself, construction of line facilities and remote control apparatus to insure dependable electrical supply, modernization of a significant number of line valves of different types and installation of electromechanical drives, and allocation of communication channels within existing communication systems.

The fact that facilities of the linear part furnished with remote control and the remote control apparatus itself are scattered over significant distances creates additional difficulties for service personnel, and requires us to furnish the services with specialized mobile laboratories carried by cross-country vehicles.

All information received by an RDP is processed by SM-2 or SM-2M control computers. These computers are the technical base of functioning ASU TPs [automated production process control systems]. Centralized control, modeling and prediction, accounting and online control subsystems are parceled out within the ASU TPs being created.

The tasks of an ASU TP include: centralized monitoring and control of oil pipeline operating conditions; optimization of operating conditions; accounting of energy and material resources; determination of the oil pipeline's handling capacity and permissible operating conditions in the presence of prescribed limitations; prediction of the characteristics of pumps and of the linear parts; automatic control of opening and shutting down the oil pipeline and transition to different operating conditions.

The work of the oil pipeline and its individual units is monitored by a dispatcher by means of color graphical and alphanumeric displays, on which mimic panels reproduce sections of the route, the oil pumping stations and

data on movement of the oil, its reserves in the tank farms and consumption of electrical energy.

Thirty-two ASU TPs servicing about 40,000 km of oil mains and over 400 oil pumping stations have now been created and are presently functioning successfully. Twelve ASU Ps and ASU OTs [not further identified] are operating at the UMN level. The economic impact from introducing computer technology exceeds 12 million rubles per year. To get an idea of the rate of introduction of different kinds of automated control systems, note that in 1977 only one ASU TP and two ASU Ps were functioning [1]. All of the work of introducing automated control systems in the Glavtransneft [not further identified] is being carried out on the basis of an integrated five-year program approved by the board of the Ministry of Petroleum Industry.

Much attention is being devoted to creating new technical standard documents or reviewing existing ones governing the principles behind the structure of automated control systems and behind automation and tele-automation of oil main facilities, and to determining the economic effectiveness of the new systems with regard for the unique features of oil pipeline transport [2-4].

Scientific organizations of the Ministry of Instrument Making, Automation Equipment and Control Systems, the Ukrainian SSR Academy of Sciences, the RSFSR Ministry of Higher and Secondary Specialized Education, the Ministry of Petroleum Industry and design institutes were contracted for work on automated control systems. Considering the need for rapid introduction of centralized dispatcher control of the work of facilities on oil mains, introduction of ASU TPs was organized in two stages. The minimum necessary complex of tasks permitting effective monitoring and control of the principal production equipment of an oil pumping station under remote control was introduced in the first stage. The main attention was devoted here to forming services to operate the remote control systems and the computers at information and control points, to preparing the production objects of control for work in an ASU TP, and to elimination of design shortcomings in devices making up the ASU TP. In parallel development of pilot models of ASU TPs capable of the entire set of functions supporting the work of the production facilities under control in information-control mode was organized within the framework of a specific-purpose integrated scientific-technical program.

This work is now in its concluding stage. Thus the Gomel administration of the Druzhba oil pipeline is creating a pilot model of an ASU TP on the basis of wide use of TM-120 remote control systems, while the Romashkinskiy Rayon oil pipeline administration is working on an ASU TP based on a UVTK-100 microprocessor remote control complex. An ASU TP introduction department was created in Kiev to coordinate the activities of ASU TP operating services in the UMN, to achieve closer interaction with developing institutes and to insure wider introduction of ASU TPs on the basis of standard documents presently being drawn up. This department has generalized work done by UMN operating services on their own initiative, and it has created an adaptable ASU TP variant with wider functional possibilities. This made it possible to raise the effectiveness of existing ASU TPs and

to implement preparatory measures for training dispatcher personnel to work with an operating ASU TP.

An ASU TP technical council was created in the Glavtransneft for operational examination and solution of scientific, methodological, organizational and technical problems arising during development and introduction of ASU TPs. It is staffed by leading specialists of the UMN and of design and scientific research organizations of the Ministry of Instrument Making, Automation Equipment and Control Systems and the Ministry of Petroleum Industry. Specialists from other interested organizations associated with development of software and nonstandard equipment and with adjustment of the apparatus are often asked to work with the council.

It is evident from the results of work done in the effort to create and widely introduce ASU TPs on oil mains that in general, the approach to solving this rather complex scientific-technical problem is fundamentally valid. Introduction of ASU TPs operating in information-advisory mode on a tight schedule in parallel with development of pilot models with a complete set of functional possibilities, to be duplicated at systems already in existence, made it possible to centralize monitoring and control of oil main facilities, and to prepare more carefully the production facilities to be controlled, and the dispatcher and operating personnel for work with information and control systems.

The positive experience of the operating services of the northwestern and upper Volga oil main administrations, which introduced systems for automated control of oil pumping units directly by computers without interference by an operator or process engineer on the basis of existing information and advisory ASU TPs, confirms the suitability of the adopted procedure for creating and introducing ASU TPs.

The main tasks concerned with ASU TPs in oil pipeline transport will be associated in the 12th Five-Year Plan with development of existing information and advisory systems and with organization of extensive duplication of standard documents drawn up for pilot models. This would require creation of specialized control, which should provide for the entire complex of adjustment and startup operations associated with introducing ASU TPs, including adjustment of complexes of technical resources and adaptation of standard software.

Because the TM-120 remote control system and the SM-2M general-purpose computer complex will continue to represent the main technical complex of the ASU TP in the 12th Five-Year Plan, development of existing ASU TPs will be supported by relatively small capital investments; however, more attention will have to be turned to providing spare parts and centralizing technical maintenance. Concurrently we need to intensify the attention of operating services toward raising the functional reliability of local automation units supporting oil pumping stations and tank farms, their continual modernization, and introduction of guaranteed power sources and electronic systems for automatic pressure control at oil pumping stations. There are plans to introduce TM-120-2 line remote control systems and insure their dependable

operation as control systems, and to begin introduction of TK-123 cathode station remote control systems, development of which is to be completed in 1985.

Efforts to create ASU TPs based on UVTK-UN microprocessor remote control complexes of a new generation will be continued concurrently. These complexes should become the basis of the technical resources of ASU TPs in the future.

In addition efforts to create local resources for automating production facilities on the basis of microprocessor technology, including pumping station and tank farm control and monitoring systems, pressure control systems, and systems for recording the quantity of pumped oil and electrical energy consumption, will be initiated on a wide scale. These efforts require examination in greater detail.

The problem of determining the actual economic impact from introducing an ASU TP, expressed in natural indicators, remains important.

There is another complex scientific-technical problem that must be solved in the 12th Five-Year Plan. It entails creation of an automated central dispatcher point (ATsDP) for control of the country's entire oil pipeline network. The ATsDP must be based on existing and new ASU TPs, and it must insure continuous control of the work of oil mains and of units accounting for oil volume, consumption of electrical energy and movement of oil in different directions within the system of oil mains.

In this fashion we will successively complete the task of increasing labor productivity, significantly raising the effectiveness of the country's oil pipeline system and raising its operating reliability.

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CSO: 1822/86

GENERAL

UKRAINIAN OFFICIALS OUTLINE ENERGY GOALS FOR 12TH FYP

Kiev PRAVDA UKRAINY in Russian 4 Sep 85 p 2

[Article by V. Keybis under the "Comprehensive Programs: Results and Prospects" rubric: "A River Called Energy"]

[Excerpts] As we have already reported, a session of the Ukrainian SSR Supreme Soviet's permanent commissions for power and for science and technology has already taken place under the chairmanship of Deputy Ya. P. Pogrebnyak.

Discussion centered on the question of carrying out the republic's special purpose over-all scientific and technical programs, "Energokompleks", within the system of the Ukrainian SSR Ministry of Power and Electrification during the years of the 11th Five-Year Plan and on the course of formulating a program for the 12th Five-Year Plan.

The commissions' preparatory group included three academicians of the Ukrainian SSR Academy of Sciences, a general designer of aircraft, important economic managers and party and government workers. Having enlisted specialists in various fields into its work, having visited labor collectives, having a large body of material and having done an excellent job of studying the work of the Ministry of Power and Electrification, the preparatory group came to the conclusion that the targets of the "Energokompleks" program for the 11th Five-Year Plan did not embrace all directions of scientific and technical progress, that plans for construction and for material and technical supply were not fully coordinated and that, for certain sections of the program, there was no determination of the final effectiveness of measures being carried out.

The "Energokompleks" program for the 12th Five-Year Plan is in the final stages of formulation. The reserves of the branch should be more fully considered in it. On the basis of accelerated introduction of the modern achievements of technical progress and by rebuilding and reequipping power industry enterprises, it is necessary to ensure further improvement in the economic indicators of the branch's work and the reliability of the power supply to the republic's national economy.

The most important practical problems of the new "Energokompleks" program have been carried over from today to tomorrow. Here are the main directions of the joint activities of all who will implement this program:

The Ministry of Power and Electrification, the Ukrainian SSR Academy of Sciences and the Minvuz [Ministry of Higher and Secondary Specialized Education] are faced with creating fundamentally new, highly effective types of equipment and technology for production of thermal and electrical power and with accelerating their introduction into practice.

The Ministry of the Coal Industry and the republic State Committee for Material and Technical Supply will be called upon to improve the provision of necessary fuel to electric power plants and to improve the quality and stability properties of energy coals in conformity with the requirements of state standards.

The State Planning Commission, the State Committee for Material and Technical Supply and the UkrSSR Ministry of Power and Electrification are to ensure that plans for capital construction and material and technical supply are in balance with goals of the "Energokompleks" program for the 12th Five-Year Plan.

The Ministry of Power and Electrification and the executive committees of the soviets of peoples deputies will have the task of keeping a closer eye on the rational utilization of fuel and power resources, of constantly improving the working and living conditions of the branch's workers, of building better housing and social, personal services and cultural facilities for them.

The "Energokompleks" program is underway. The progress made during its first five years should not be undone. The republic's river of power must grow deeper and more powerful.

13032/13068  
CSO: 1822/61

GENERAL

OVERVIEW OF FIGURES ON ELECTRIC POWER GENERATION

Riga KOMMUNIST SOVETSKOY LATVII in Russian No 10, Oct 85 pp 43-50

[Article by K. Malyarenko, candidate of economic sciences: "From the State Commission for the Electrification of Russia to the Energy Program"]

[Excerpt] The use of electricity to serve the consumer needs of Soviet people is also having great positive results. For example, a family of four requires 8-12 man-hours a day of service without electrical power, and only 2-3 man-hours with it. This provides additional free time for the satisfaction of people's spiritual needs. For this reason, the CPSU wants to increase the use of electrical power in municipal and domestic services by almost 25 percent, or 227 billion kilowatt-hours, during the years of the 11th Five-Year Plan.

Today our main generators of electricity are heat and electric power stations (TES's). They generate more than 70 percent of all electric power. But many of them are outdated and need radical modernization. They take twice as much fuel as TES's with modern equipment, and their repair costs and personnel staffs are 5-10 times as great. For this reason, in addition to the construction of new large TES's operating on the cheap coal of the Kansk-Achinsk and Ekibastuz basins, the Energy Program envisages the radical remodeling of existing TES's.

The production of electricity and heat in a single installation at central heating plants has been combined successfully in the Soviet Union. The use coefficient of fuel in these installations is 1.5 times as high as when these types of energy are produced separately. This is still one of the most effective advances in the development of power engineering.

The further development of hydraulic power engineering occupies an important place in the Energy Program. As we know, new giant power plants are being built on rivers in Siberia, the Far East and Central Asia with a view to the comprehensive use of water resources, and hydraulic accumulator power plants (GAES's) are being built in the European part of the Soviet Union. These help to control energy consumption and are designed to secure the reliable, steady and economical operation of nuclear and thermal power plants. Most of the hydraulic machinery, hydrogenerators and other equipment for these stations are unique in terms of their parameters. They are being developed for the first time in our country and surpass the best world models in many respects.

Hydroelectric power stations are valuable because they operate on renewable sources of energy and generate cheaper electricity than thermal and nuclear power plants. The GES's annually produce up to 2.5 billion rubles in profits and save at least 75 million tons of organic fuel just in the production of electricity. Labor productivity is 5-7 times as high in these stations as in heat and electric power stations, and the figure rises to 10-12 times if expenditures on the extraction and shipment of fuel are included in the calculations.

Nuclear power engineering, as one of the most promising means of electrification, has also been assigned an important role in the further augmentation of the electrical power output and the improvement of the country's fuel and energy balance. During the 11th Five-Year Plan, the nuclear power plants (AES's) will account for virtually the entire increase in the output of electrical power in the European part of the country, as a result of which its share of the total output should rise to 14 percent. A substantial increase in the output of electrical power at AES's is expected by the end of the century. To this end, AES's with 1-1.5 million kilowatt power units are being erected in the European part of the Soviet Union. Million-kilowatt facilities will begin operating this year at the Kurskaya, Smolenskaya, Balakovskaya and Zaporozhskaya AES's.

A new field of nuclear power engineering, the use of nuclear power to generate heat for cities and industrial enterprises, will be developed on a broad scale. The USSR is the pioneer in this field.

The exceptionally high power-intensiveness of nuclear fuel (2.5 million tons as high as in the case of coal), which promises a tremendous savings in organic fuel and the possibility of locating AES's in economically convenient regions without any need to have sources of fuel nearby, is turning nuclear power engineering into the main element of the country's fuel and energy sector.

The AES's reduce environmental pollution considerably: In contrast to stations operating on organic fuel, they do not emit sulfur, nitrogen or carbon dioxide and do not consume oxygen.

The further development of electrical power engineering will also entail the completion of the unified electrical power network in the country, which now supplies electricity to a territory covering more than 10 million square kilometers, with a population of around 220 million. The Central Asian and Far Eastern power networks will be connected to it within the next few years. Its geographic expansion will be accompanied by its improvement.

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CSO: 1822/98

GENERAL

UDC 621.31:658.264

EFFICIENCY OF ELECTRIC HEAT SUPPLY SYSTEMS IN NEW POWER-ENGINEERING DEVELOPMENTS

Moscow ELEKTRICHESKIYE STANTSII in Russian No 7, Jul 85 pp 51-55

[Article by Yu. A. Borodkin, V. V. Yershevich, V. Ya. Peysakhovich, candidates of technical sciences, Energosetproyekt [All-Union State Planning, Surveying and Scientific Research Institute of Power Systems and Electric Power Networks]]

[Abstract] A variety of heat-supply systems were compared regarding their fuel-use rates, types of fuels used and costs. The comparison showed that the main technical and economic merits of electric heat supply systems are: savings of high-grade organic fuels, ease of maintenance, flexible regulation, precise power-use estimates, ease of installation, reliability, their ability to store power during low-load night hours for use in high-demand daylight hours, reductions in operating personnel strength. Centralized and decentralized traditional heat supply systems are compared to individual electric heat supply systems (direct and heat-pump type). Power generators compared were those used in TETs's [Heat and Electric Power Stations] and large boiler houses (50 hectocalories/hour and more). Small boiler houses and local heat generators represented decentralized heat supply systems. Electric heat supply systems were represented by AES's, KES's [Condensing Power Plants] and TETs's. Comparison data were gathered in a single economic district of the European USSR. In view of the decreasing recovery levels of high-quality organic fuels, the widespread introduction of nuclear fuel into the fuel-energy balance, and the price hikes of remaining power resources the field of application of electric power should be broadened, particularly in the European USSR. Electric heat supply systems are supplanting the less effective systems such as small-scale boiler houses. This will effectively deal with the problem of consumption of scarce and costly fuels. When future base load electrical demands in the European USSR are handled by AES's, electrical heat supply systems will handle the hot water supply, primarily through the use of storage-type systems. Electrical heat supply systems will have to be automated, and their introduction based on technical and economic estimates and local conditions.

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GENERAL

POWER MINISTRY OFFICIALS DEAL WITH PEAK LOAD DEFICIENCIES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Oct 85 p1

[Unsigned article: "Once More Concerning Frequency"]

[Text] SOTSIALISTICHESKAYA INDUSTRIYA published an article with this title on 28 June. In it, the editors continued a discussion already begun by the paper ("Speaking Out About Frequency" of 23 March) concerning the unpleasant consequences of a drop in current frequency in the Unified Power System and about the great damage inflicted on the national economy by the low quality of electric power.

At the direction of the USSR Council of Ministers, the materials presented by the paper have been examined by the USSR State Planning Commission, the USSR Ministry of Power and Electrification, the Ministry of the Electrical Equipment Industry, the State Committee for Standards and the USSR State Committee on Prices. The question of improving the quality of electric power as it relates to such an important parameter as current frequency was acknowledged to be urgent. A drop in current within the USSR power systems below limits authorized by the All-Union State Standard occurs mainly as a result of a shortage of electric capacity compared to requirements at peak loads.

In calculations for setting the basic directions of economic and social development of the USSR national economy in the 12th Five-Year Plan, the USSR State Planning Committee and the Ministry of Power and Electrification envisage the activation of necessary electric power capacity. This will make it possible to more than double reserve capacity in comparison with 1984. It is also foreseen that interruptions and limitations in the capacity of existing electric power plants will be eliminated.

To increase the responsibility and improve the incentives of electric power plant personnel in the utilization of capacity, the USSR State Planning Committee, Ministry of Finance and Ministry of Power and Electrification have agreed on principles of reorganizing electric power industry operational mechanisms as well as on time schedules and on a system for developing corresponding methodological and normative documentation. There is a plan to transfer the USSR Ministry of Power and Electrification in 1986 to a new system of planning and incentives that employs the coefficient of the

effectiveness of installed capacity utilization as the basic capital-formation and incentives indicator.

The part played by enlisting the help of customers in regulating loads during hours of maximum use is of no small importance in maintaining frequency of electric current. With this aim, the USSR State Planning Committee, State Committee on Prices and Ministry of Power and Electrification have approved a plan of measures for changing the power network over to a system of accounts with electric power customers which is based on price rates differentiated according to time of day. An experiment along these lines is now being conducted at a number of industrial enterprises in the Leningrad power system.

To reduce maximum electric power loads, the USSR Ministry of Power and Electrification is developing electric power consumption plans which it is coordinating with consumers. Modernization and rebuilding of equipment at thermal electric power plants, now in progress, will also help to reduce disruptions and to improve the utilization of existing electric power plant capacities.

Implementing the measures which have been worked out for balancing power capacities will make it possible to supply electric power to the production process with a current frequency consistent with the All-Union State Standard.

13032/13068  
CSO: 1822/61

GENERAL

TECHNICAL ASPECTS OF KANEVSKAYA PUMPED STORAGE PROJECT

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3 (125) Jul-Sep 85 p 50

[Article by A. Panov]

[Text] A public discussion of the detail design for the Kanevskaya hydroelectric pumped storage power plant was held in Kiev on July 10, 1985 at an enlarged session of the presidium of the Kiev board of the NTOEiEP [Scientific-Technical Society of the Energy and Electrotechnical Industry].

Taking part in the work of the presidium were representatives of the UkrSSR Minenergo [Ministry of Energy and Electrification], PEO [Economic Planning Section] Kievenergo, and planning, design and scientific-research organizations from the Kiev region.

S.G. Ageyev, chief engineer of the project and associate of the Ukrainian section of the Gidroproyekt Institute, presented a paper on the basic provisions of the detail design for the Kanevskaya GAES [hydroelectric pumped storage power plant].

In the course of discussing the detail design, it was noted that the unique structure of the Kanevskaya GAES is urgently needed to cover the variable electric loads in the OES [Unified Energy System] of the South.

The Kanevskaya GAES will provide a significant peak and semi-peak reserve of power with weekly regulating. The energy volume of the upper basin will allow a nine-hour zone of the load schedule, on the average, to be covered with a capacity of 2,910,000 kilowatts and will allow the OES to be served with a fast-acting 300,000 kilowatt reserve.

The high level of the detail design as well as the use of new designs in it were noted in the course of the discussion. Maximum utilization of the natural relief of the terrain is stipulated in the design, which allows significant reduction in the expenditures for the construction of an upper reservoir. Particularly highly appraised was the suggested alternative of constructing the GAES building in blocks, by the moveable well method, which has no analogs in the practice of domestic hydro-construction.

The advanced designs guarantee high profitability and speedy pay-back for the station. Besides this, the operation of the GAES will facilitate the sanitation

of the Kanevskiy Reservoir, thanks to the mixing of large masses of water and the saturation of the water with oxygen, which will permit a reduction in the number of stagnation zones and a lowering of the intensity of "bloom" in the reservoir water. Besides this, those attending the session expressed a number of observations and suggestions to the authors of the design. Thus, an opinion was expressed on the necessity for additional study of the influence of the GAES on the water regime and fish farming in the Kanevskiy Reservoir, in view of the capacity and cyclicity of GAES operation.

The attention of the project authors was directed to the need for more detailed examination of the problems of diagnosing and analyzing the status of the equipment being installed, taking into consideration the latest achievements in this field. The hydraulic power section of the Kiev board of the NTOEiEP was advised to set up and conduct, in 1986, a seminar on the problems of diagnostics with regard to hydraulic power equipment.

It was also recommended to the authors of the project that they stipulate, besides the planned two 750-kilowatt VLs [expansion unknown], the connection of a 330-kilowatt VL at the outlet of the station in order to increase the reliability of the GAES link to the energy system.

Recommendations addressed to construction, economic and industrial organizations were adopted at the session:

--to recommend to the Yuzhatomenergostroy Trust that, simultaneously with the construction of the GAES, they undertake construction of housing and social welfare objectives. To request the necessary means for this from USSR Minenergo;

--to ask USSR Minelektrotekhprom to examine the possibility of developing and manufacturing triple-phase 750-kilowatt transformers for the Kanevskaya GAES, with a capacity of 1250 megawatts, which will allow a significant reduction in the amount of equipment (per one transformer in a block of four hydraulic machines);

--to ask USSR Minenergomash and the Leningrad Metal Plant PO [production association], considering the projected 1985 start-up of units at the Zagorskaya GAES and the accumulation of experience in operating them, to increase the unit power of hydraulic power units at the Kanevskaya GAES from 225 to 300 megawatts, which will permit a reduction in the number of units from 16 to 12 and, consequently, in the number of pipelines, hydrotechnical structures and operating expenses by approximately 20 percent;

--to ask USSR Minelektrotekhprom to examine the possibility of assembling the generators for the Kanevskaya GAES under factory conditions, having excluded the mixture of stators at the assembly site, with a view to accelerating assembly and raising the quality of work.

The presidium of the Kiev NTOEiEP evaluated the project, completed at a high level, and came to the unanimous opinion that it is necessary to accelerate construction of the Kanevskaya GAES.

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CSO: 1822/42

GENERAL

ECOLOGICAL IMPACT OF NUCLEAR, OTHER POWER PLANT STATIONS

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3 (125) Jul-Sep 85 p 53

[Unsigned, untitled article under the rubric "Chronicle"]

[Excerpts] The 7th Plenum of the Ukrainian Republic board of the NTO [Scientific-Technical Society] for Energy and Electrotechnical Industry imeni Academic G.M. Krzhizhanovskiy took place in Kiev on May 31, 1985.

The plenum discussed the question of "defending the environment from the harmful effects of the energy industry and tasks for organizations belonging to the NTO for Energy and Electrotechnical Industry".

As a result of the implementation of new purification works and the expansion of existing ones, the institution of circulating water-supply systems, and the fulfillment of measures to increase the efficiency of sewage-treatment processes, the UkrSSR Minenergo has reduced the discharge of polluted water by 71 percent.

The reconstruction and modernization of gas-cleaning equipment, the application of advanced methods of gas cleaning, and the optimization of the fuel balance has allowed a 16.5-percent reduction in the discharge of harmful substances into the atmosphere. The first stage of a complex of operations for the reconstruction and modernization of ash-collecting equipment has been completed.

With the aim of further reducing the harmful effect of the energy industry on the environment, a number of academic, scientific-research and design institutes and vuzes are conducting work researching the leading methods of purifying flue gases and sewage and instituting undeviating technologies.

Facilities for the extraction of dry ash for the needs of the construction industry have been built and put into operation at a number of electric power plants. Operations have begun to set up experimental-industrial facilities for the complex processing of ash waste at the Voroshilovgrad GRES [State Regional Electric Power Plant]. At the Zaporozhye, Tripolskiy and Uglegorsk GRES and the Kiev TETs [Thermoelectric Plant] -5 facilities have been installed for the retrieval of vanadium-containing sludge from water washed from the surfaces of heating oil-fired boilers.

Work is ongoing on the meteorological support of AES [Nuclear Electric Power Plants] and on the study of the influence of an AES on the microclimate. There are plans for the setting-up and implementation of systems for controlling the environment in AES operating conditions.

NTOEiEP organizations are taking part in the development and implementation of technical and organizational measures to preserve the environment from the harmful effect of the energy industry. Recommendations were drawn up on the problems of utilizing the ash-slag wastes from thermoelectric power plants for the needs of construction and the production of construction materials, reducing the discharge of polluted water, automating control and prediction of the air-pollution level, and exploiting and modernizing means for protecting the environment.

In presentations at the plenum the need was noted to have more centralized, creative participation on the part of scientific-technical society in the solution of problems relating to the preservation of the environment and the rational utilization of natural resources.

In a resolution adopted at the plenum, tasks were defined whose solution requires that republic and oblast boards and the primary organizations of NTOEiEP concentrate their attention. It was recommended that NTOEiEP organizations practice more broadly the execution of public examinations of designs for the establishment and reconstruction of energy objectives, with a view to developing suggestions directed toward the achievement of the ecological cleanliness of these objectives, that they conduct goal-oriented competitions for better operation in terms of preserving the environment, and that they analyze the operating condition of purifying equipment and installations as well as the utilization of energy-industry wastes.

A.V. Gritsenko, first deputy minister for energy and electrification for the UkrSSR and chairman of the Ukrainian Republic board of the NTOEiEP, appeared at the plenum with a concluding speech.

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GENERAL

SYNOPSIS OF ARTICLES IN ENERGETIKA I ELEKTRIFIKATSIYA, NOS. 2-3, 1985

Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 3 (125) Jul-Sep 85 p 56

UDC 621.181.8:046.58

PRIMARY CAUSES OF SLAGGING IN CONVECTION SUPERHEATERS ON TYPE TP-100 BOILERS  
WHEN INFERIOR QUALITY COALS ARE BURNED

[Synopsis of article by P.I. Yanko and V.V. Vergeles, No 3 pp 11-13]

[Text] Results are cited for laboratory studies of the physical and chemical characteristics of ash from Silezskiy Basin coal, Donetsk Basin middlings and rock. The temperature is determined for the beginning of intensive drift in the convection superheaters on a boiler. The primary causes are stated for slagging in convection superheaters when fuels are burned that have a high ash content. Recommendations are given for increasing the slag-free steam generating of boilers. One table, two illustrations, four references.

UDC 519.2:621.18

A SYSTEM FOR STABILIZING FUEL FEED TO BOILER BURNERS ACCORDING TO THE TEMPERATURE  
OF THE AIR MIXTURE

[Synopsis of article by V.I. Pershin, L.A. Kesova, A.V. Georgiyev, No 3 pp 14-15]

[Text] The results are cited of studies of the dust-feed system of the TPP-210A boiler at the Tripolskiy GRES [State Regional Electric Power Plant]. The studies were carried out with a view to obtaining a representative and reliable signal in terms of dust consumption and using it in an automated system for the stabilization of coal-dust feed to boiler burners. According to the results of the research, a new system for automated stabilization of coal-dust feed to boiler burners has been developed and instituted. The signal of the air-mixture temperature is obtained with the aid of a thermocouple of special design. Two illustrations.

UDC 621.227.3

## HYDROIMPULSE CLEANING OF REGENERATIVE AIR HEATERS

[Synopsis of article by V.I. Tanskiy, V.A. Zhmurko, O.A. Myagkov, No 3 pp 15-19]

[Text] A device that uses pulsing streams of water created by a flow interrupter is suggested for cleaning the coils of regenerative air heaters. The design execution of the device, the principles of its operation and the results of its application at the Starobeshevskaya GRES are examined. One table, two illustrations, three references.

UDC 621.311.22:621.165:536.51

## THERMOMETRIC CONTROL IN THE OPERATION OF TURBINES IN A CONTROL MODE

[Synopsis of article by B.I. Pas'ko, D.B. Kapelovich, No 3 pp 19-22]

[Text] The article cites experimental results of using standard and experimental quick-response thermocouples in the operation of turbine-driven sets in a control mode. It lists graphic experimental dependencies that illustrate a reduction in thermocouple performance in the process of operation. It proposes means of improving the quality of thermocontrol. Four illustrations, four references.

UDC 662.76:621.18

## COMBUSTION OF NATURAL GAS IN THE FURNACE OF TPP-312 BOILERS WITH REDESIGNED BURNERS

[Synopsis of article by V.I. Koshman, V.I. Bratkov, A.G. Linnik, No 3 pp 22-24]

[Text] The article cites tests of TPP-312 and TPP-312A boilers burning natural gas and equipped with redesigned straight-flow blade burners with 100-megawatt thermal capacity. Over the load range of the unit 150-300 megawatts (50-100 percent  $D_{nom}$  [as published]) the heating surfaces of the boiler operate reliably, providing economical steam conditions. The economical burning of natural gas is achieved in the operation of eight burners with an even distribution of gas and air. Restriction of boiler loads from drafts does not occur. Recommendations are given to increase the reliability and economy of boiler operation. Two illustrations, two references.

UDC 669.24:621.438:620.9

## CERTAIN PRINCIPLES OF MAKING NICKEL-IRON ALLOYS WITH THE SET PARAMETERS OF THERMAL EXPANSION

[Synopsis of article by A.D. Koval', Ye.L. Sanchugov, B.A. Piliyev, No 2 pp 29-30]

[Text] This work examines certain aspects of the composition and structure of alloys on a nickel-iron base that influence the change in the design gap between compatible parts of a GTD [gas-turbine engine] in the process of operation. It is shown that increasing the content of aluminum, titanium, iron, tungsten and molybdenum facilitates a reduction in the average coefficient of linear expansion, which is conditioned by their physical and chemical properties, phase-forming capabilities and influence on the degree of heterogeneity of alloys.

CONSTRUCTION OF GENERATOR-REGULATORS OF CURRENT WITH OPTIMAL PARAMETERS

[Synopsis of article by V.Yu. Palichevskiy, No 3 pp 37-38]

[Text] The article examines a way of improving the performance of direct current generator-regulators with semiconductor breakers; the method consists in controlling the magnitude of hysteresis of the generator element in the frequency function of its switching as well as the set value of current load. It suggests a comparatively simple control algorithm and a structural scheme for its realization that guarantees an energy effect close to the maximum attainable. It cites the methodology of choosing constant coefficients of the equation of the control algorithm depending on the parameters of the regulator system. Three illustrations, three references.

UDC 621.311.1:62—52.

INCREASING VOLTAGE IN ASU [AUTOMATED CONTROL SYSTEMS] OF ELECTRICAL SUPPLY AT INDUSTRIAL ENTERPRISES

[Synopsis of article by V.V. Prokopenko, K.P. Kudovbenko, No 2 pp 40-43]

[Text] The article examines a possible approach to solving the problem of increasing the quality of voltage in units of an electrical supply system. For this purpose it proposes the use of information-control systems of electricity consumption supplemented with new problem functions. It cites the results of experiments that support the possibility of effectively controlling voltage in load units and the advantage of setting up control systems. Three illustrations, five references.

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CSO: 1822/42

GENERAL

BRIEFS

UZBEK POWER PROBLEMS--UzTAG--A serious situation has developed with regard to coal mining at the Angren coal mine. Since the start of the year, fuel production has fallen short by about 600,000 tons, and this threatens the operation of the Novoangren GRES. Because of the unsatisfactory state equipment, the low level of its use and repair, and because of frequent violations of water-chemistry routines at the power units as a result of insufficient technical planning, the Syrdar'ya GRES has not reached its full capacity. Construction of gas and power projects by Glavreditneftegazstroy [Central Asian Petroleum and Gas Construction MA] and the Uzbekgidronenergostroy [Uzbek Hydroelectric Power Construction] trust is going slowly. The directors of the Uzbek SSR Ministry of Power and Electrification, along with local party and government organs, must eliminate these shortcomings and must ensure the unconditional activation of all planned fuel and power projects, including Unit No. 2 at the Novoangren GRES, the second boiler unit and turbogenerator at the Mubarek TETs, Boiler No. 7 at the Severnaya heating plant in Tashkent, the gas compressor stations on the Severnyy Sokhv-Namangan gas pipeline, and new capacity at the Shurtan gas complex and the Mubarek gas processing plant. [Excerpt] [Tashkent PRAVDA VOSTOKA in Russian 1 Oct 85 p 1] 13032/13068

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**DATE FILMED**

30 January 86